US008972050B2

(12) **United States Patent**
Johnson et al.

(10) **Patent No.: US 8,972,050 B2**
(45) **Date of Patent: *Mar. 3, 2015**

(54) **PHARMACEUTICAL DISPENSING SYSTEMS AND GRAPHICAL USER INTERFACES ASSOCIATED WITH SAME**

(75) Inventors: **Matthew Johnson**, Raleigh, NC (US); **Harold Lindsey**, Chapel Hill, NC (US); **Megan Dunigan**, Raleigh, NC (US); **Justin Lallinger**, Durham, NC (US); **John Kirk Hammond, Jr.**, Raleigh, NC (US)

(73) Assignee: **Parata Systems, LLC**, Durham, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1068 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/466,717**

(22) Filed: **May 15, 2009**

(65) **Prior Publication Data**

US 2009/0287347 A1 Nov. 19, 2009

Related U.S. Application Data

(60) Provisional application No. 61/053,921, filed on May 16, 2008, provisional application No. 61/053,735, filed on May 16, 2008, provisional application No. 61/077,661, filed on Jul. 2, 2008, provisional application No. 61/105,529, filed on Oct. 15, 2008.

(51) **Int. Cl.**

G06F 17/00	(2006.01)
G06F 3/01	(2006.01)
G07F 11/00	(2006.01)
G06F 19/00	(2011.01)
G07F 11/30	(2006.01)
G07F 11/44	(2006.01)
G07F 11/62	(2006.01)
G07F 17/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G07F 11/002*** (2013.01); ***G06F 19/3462*** (2013.01); ***G07F 11/30*** (2013.01); ***G07F 11/44*** (2013.01); ***G07F 11/62*** (2013.01); ***G07F 17/0092*** (2013.01)

USPC **700/241**; 700/236; 700/244

(58) **Field of Classification Search**

CPC G06F 19/3462

USPC 700/236, 241, 244

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,002,753 A	5/1935	Parks et al.
2,442,025 A	5/1948	Smith
3,194,431 A	7/1965	Garvin
3,938,700 A	2/1976	Camp et al.

(Continued)

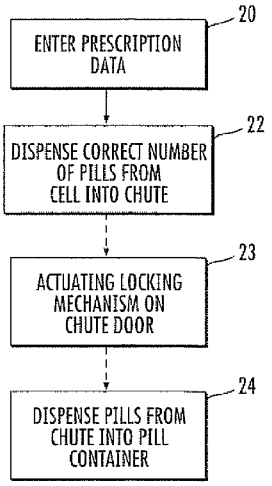
Primary Examiner — Michael K Collins

(74) *Attorney, Agent, or Firm* — Myers Bigel Sibley & Sajovec

(57) **ABSTRACT**

A pharmaceutical dispensing system includes a frame having first and second opposed sides, a plurality of cells configured to house pharmaceutical pills, a first touch screen display on the frame first side, and a second touch screen display on the frame second side. The pharmaceutical dispensing system includes a processor and memory coupled thereto. A computer program resides in the memory and is executable by the processor for displaying a cell inventory graphical user interface (GUI) within the first touch screen display, and a prescription order processing GUI within the second touch screen display that include status information about a prescription order at a respective stage of completion by the pharmaceutical dispensing system.

17 Claims, 37 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

4,232,800	A		11/1980	Martin et al.
4,303,179	A		12/1981	Spring
4,546,901	A		10/1985	Buttarazzi
4,694,230	A		9/1987	Slocum et al.
4,740,025	A		4/1988	Nelson
4,782,274	A		11/1988	Teegarden et al.
4,812,629	A		3/1989	O'Neil et al.
5,208,762	A	*	5/1993	Charhut et al. 700/216
5,337,919	A		8/1994	Spaulding et al.
5,593,267	A	*	1/1997	McDonald et al. 414/273
5,720,154	A	*	2/1998	Lasher et al. 53/411
5,771,657	A		6/1998	Lasher et al.
5,907,493	A	*	5/1999	Boyer et al. 700/231
6,202,923	B1		3/2001	Boyer et al.
6,370,841	B1		4/2002	Chudy et al.
RE37,829	E		9/2002	Charhut et al.
6,522,945	B2	*	2/2003	Sleep et al. 700/225
6,742,671	B2		6/2004	Hebron et al.
6,963,791	B1	*	11/2005	Frederick et al. 700/244
7,228,198	B2		6/2007	Vollm et al.
7,530,211	B2	*	5/2009	McErlean et al. 53/505
7,720,569	B2	*	5/2010	Forrester et al. 700/241
7,783,383	B2	*	8/2010	Eliuk et al. 700/245
7,805,217	B2	*	9/2010	Chudy et al. 700/237
7,860,724	B2	*	12/2010	Chudy et al. 705/2
7,912,582	B1	*	3/2011	Holtje et al. 700/242
8,215,540	B2	*	7/2012	Szesko et al. 235/375
8,571,886	B2	*	10/2013	Chudy et al. 705/2
2004/0088187	A1	*	5/2004	Chudy et al. 705/2
2004/0133705	A1		7/2004	Broussard et al.
2005/0033606	A1	*	2/2005	Miller 705/2
2006/0161298	A1	*	7/2006	DiMaggio 700/244
2006/0265102	A1	*	11/2006	Bain 700/237
2007/0208595	A1	*	9/2007	Ohmura et al. 705/2
2008/0125897	A1	*	5/2008	DiGianfilippo et al. 700/110
2009/0043421	A1	*	2/2009	Parrish et al. 700/241
2011/0131056	A1	*	6/2011	Chudy et al. 705/2

* cited by examiner

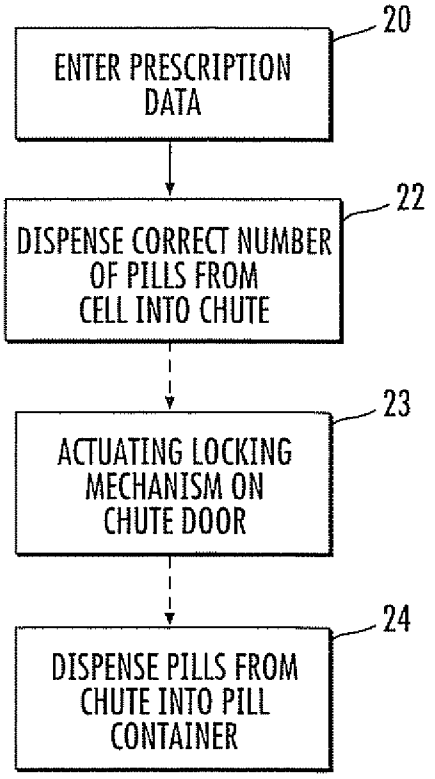

20
ENTER PRESCRIPTION DATA
22
DISPENSE CORRECT NUMBER OF PILLS FROM CELL INTO CHUTE
23
ACTUATING LOCKING MECHANISM ON CHUTE DOOR
24
DISPENSE PILLS FROM CHUTE INTO PILL CONTAINER

FIG. 1

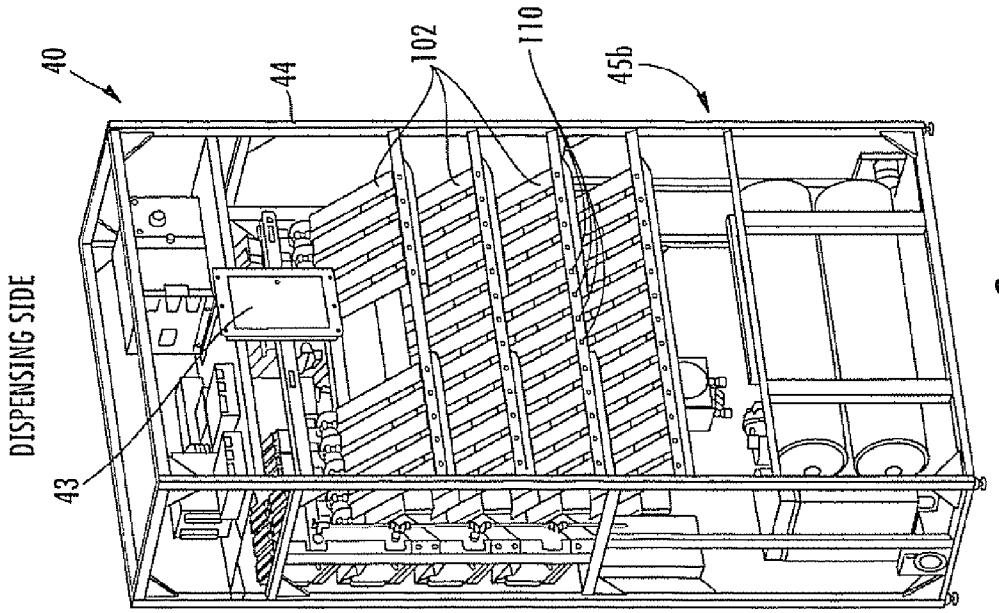

40
44
102
110
45b
DISPENSING SIDE
43

FIG. 3

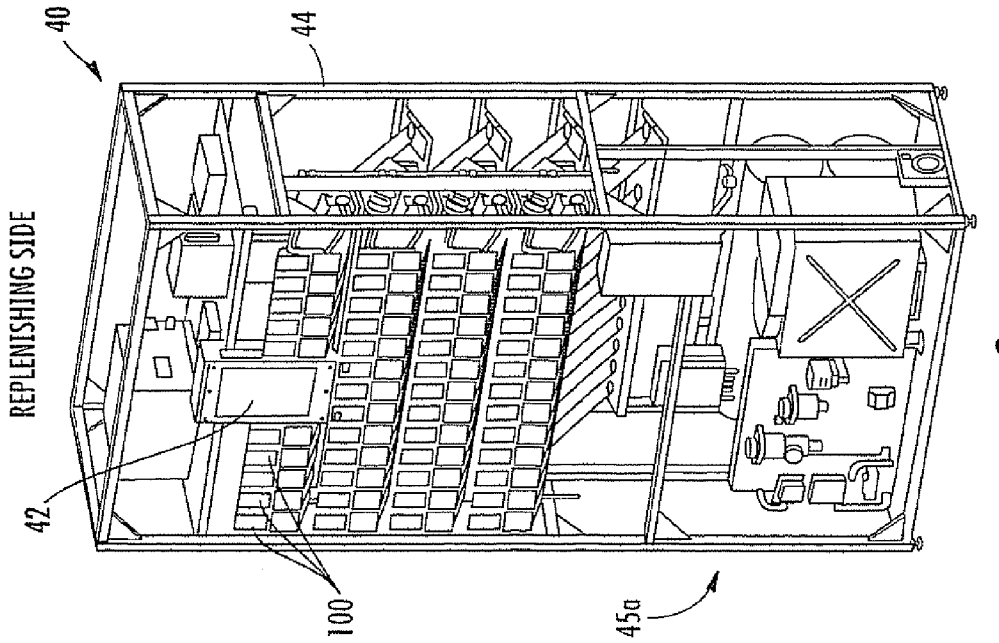

40
44
REPLENISHING SIDE
42
100
45a

FIG. 2

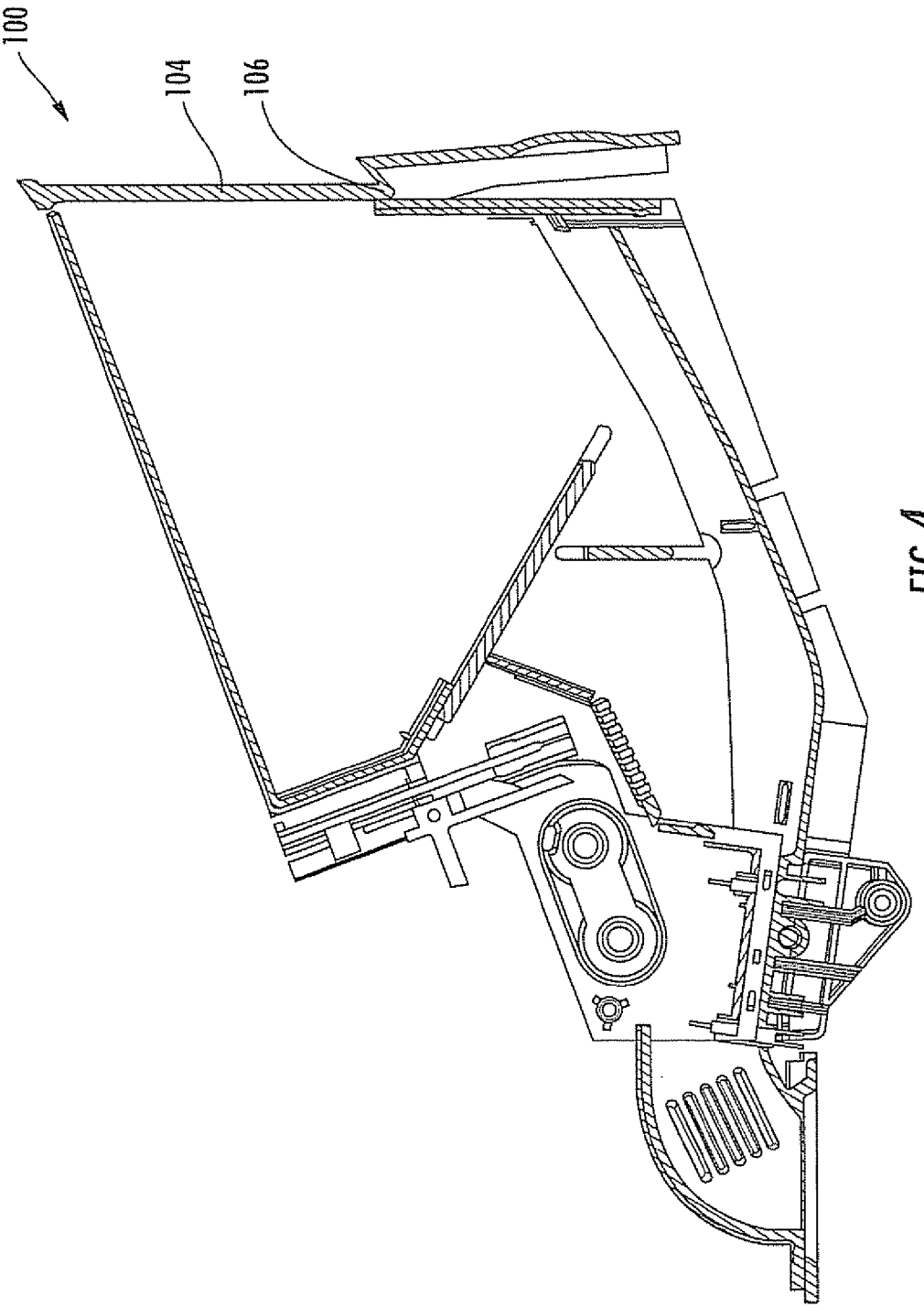


FIG. 4

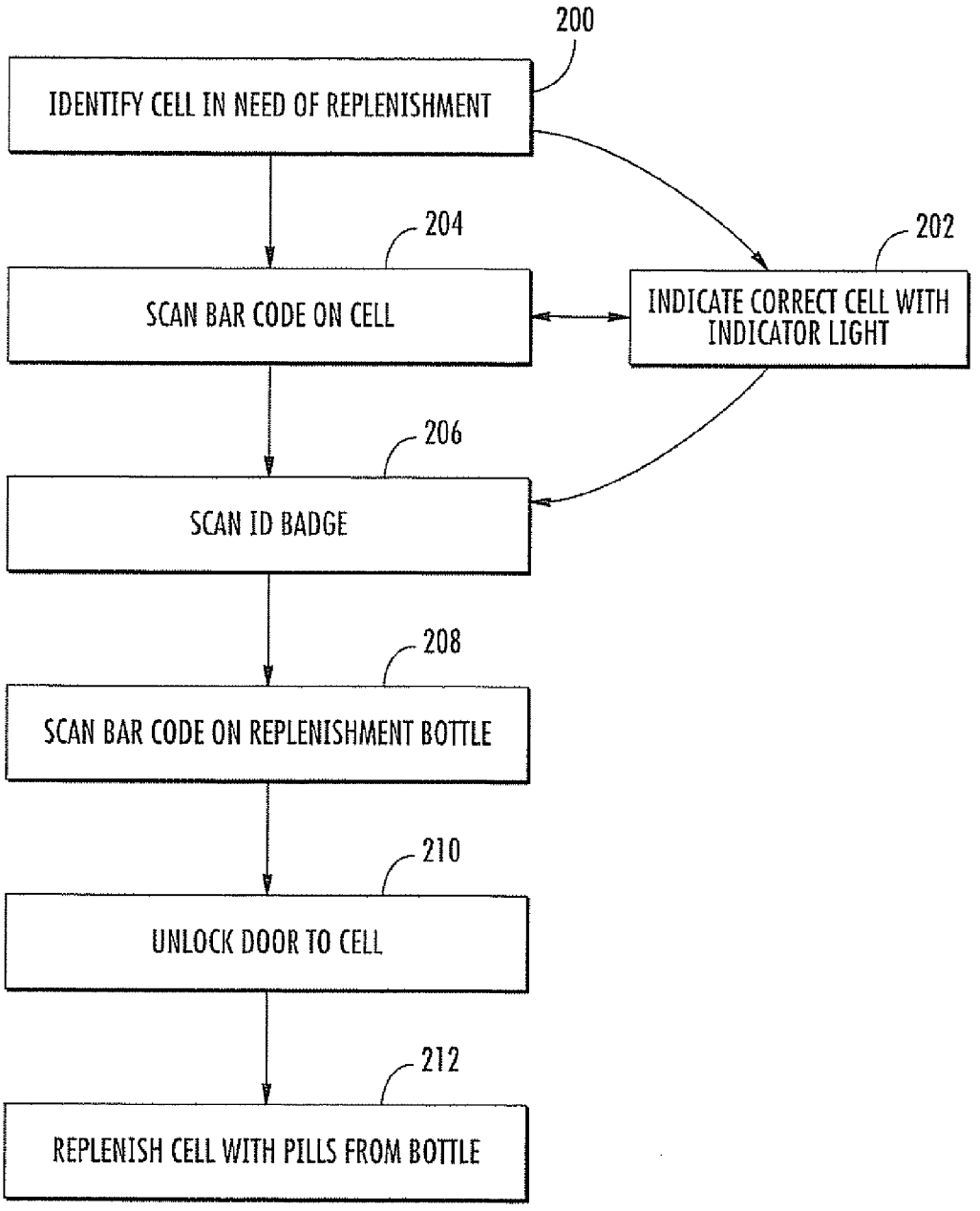

200
IDENTIFY CELL IN NEED OF REPLENISHMENT
204
SCAN BAR CODE ON CELL
202
INDICATE CORRECT CELL WITH INDICATOR LIGHT
206
SCAN ID BADGE
208
SCAN BAR CODE ON REPLENISHMENT BOTTLE
210
UNLOCK DOOR TO CELL
212
REPLENISH CELL WITH PILLS FROM BOTTLE

FIG. 5

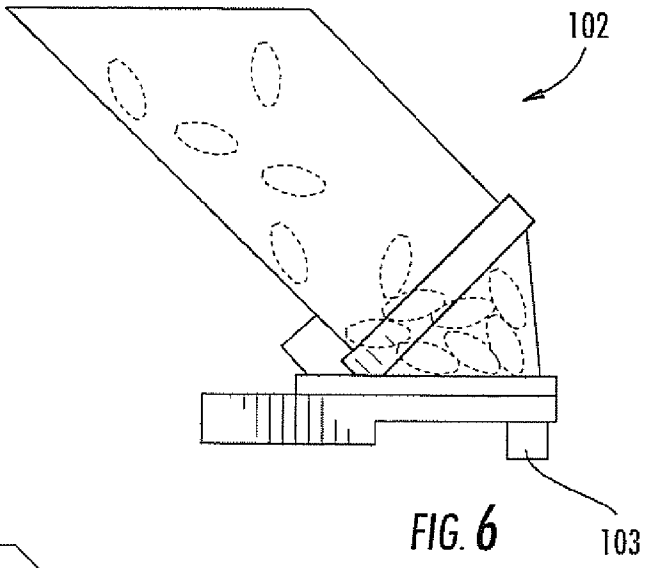


FIG. 6

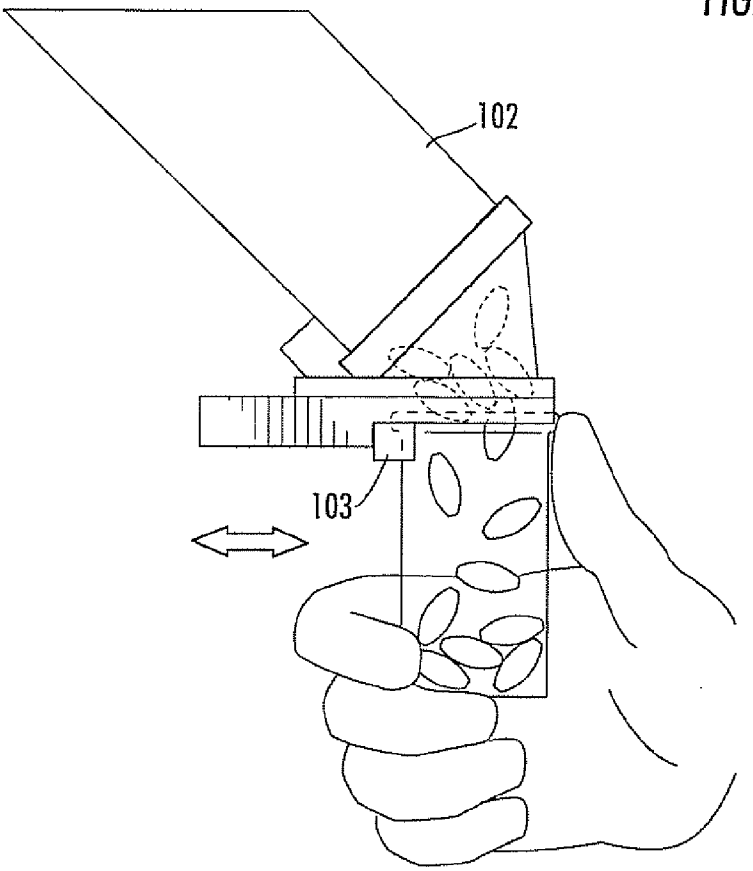


FIG. 7

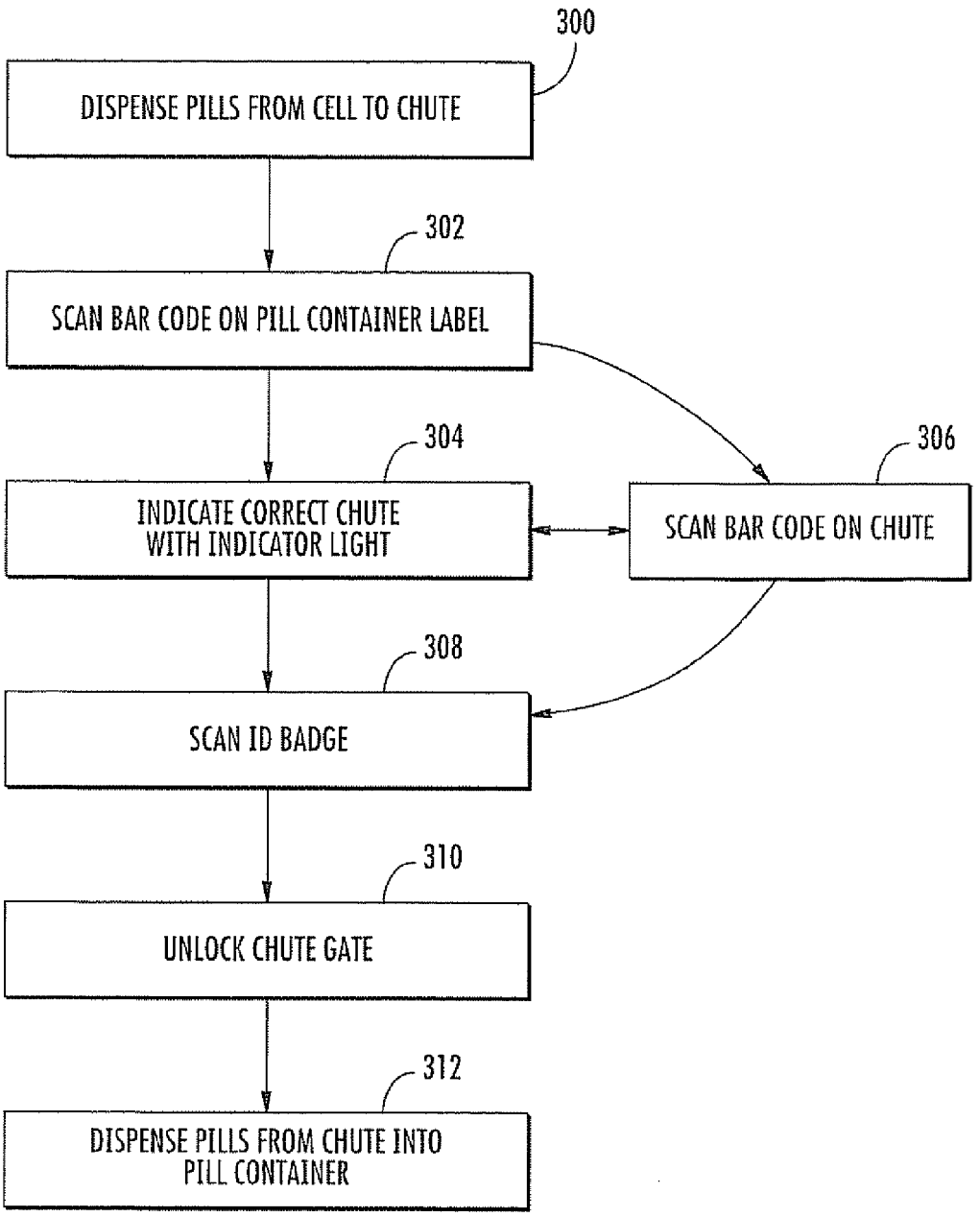

300
DISPENSE PILLS FROM CELL TO CHUTE
302
SCAN BAR CODE ON PILL CONTAINER LABEL
304
INDICATE CORRECT CHUTE WITH INDICATOR LIGHT
306
SCAN BAR CODE ON CHUTE
308
SCAN ID BADGE
310
UNLOCK CHUTE GATE
312
DISPENSE PILLS FROM CHUTE INTO PILL CONTAINER

FIG. 8

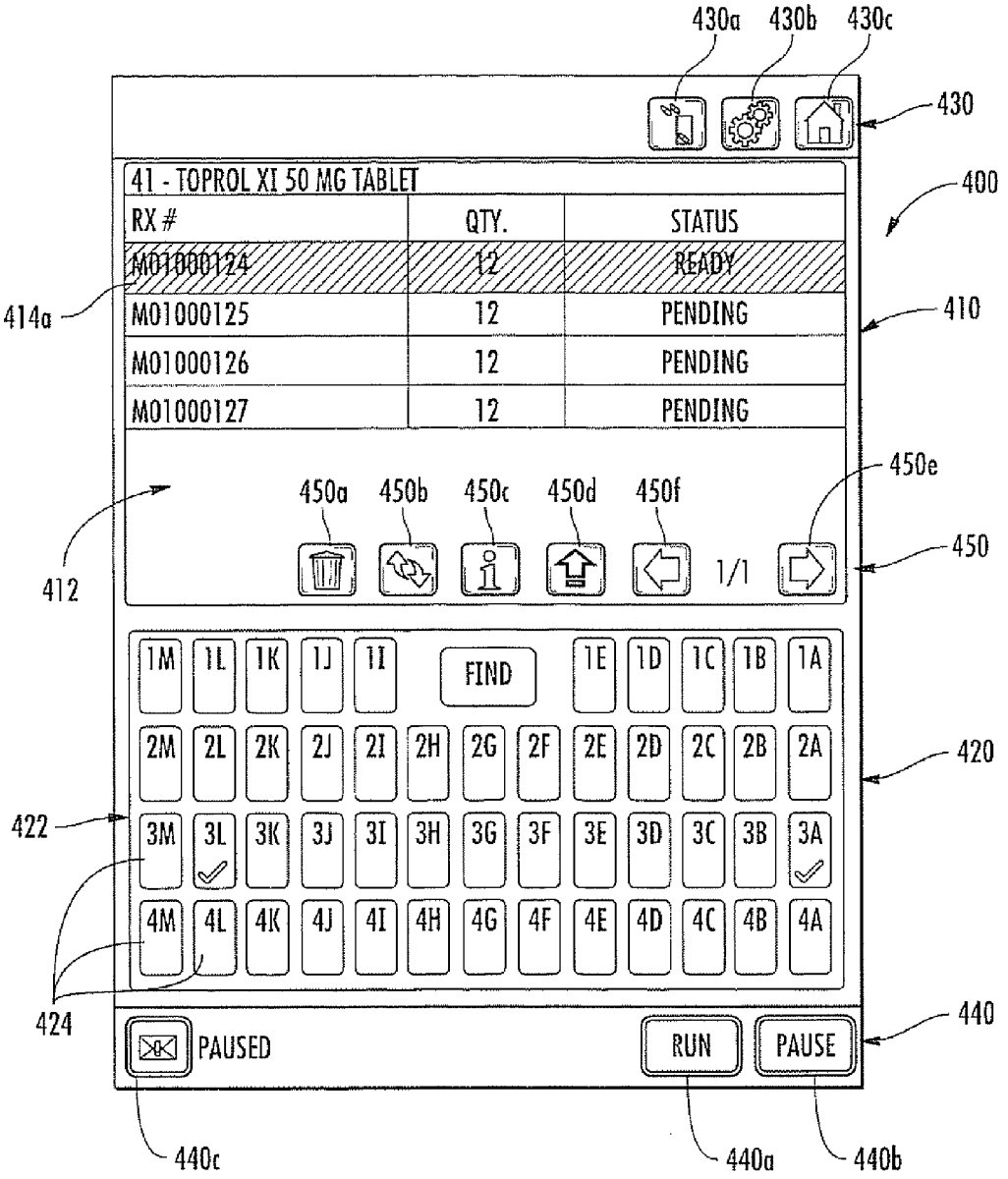

430a
430b
430c
430
400
41 - TOPROL XI 50 MG TABLET
RX #
QTY.
STATUS
M01000124
12
READY
M01000125
12
PENDING
M01000126
12
PENDING
M01000127
12
PENDING
414a
410
450a
450b
450c
450d
450f
450e
450
1/1
412
1M 1L 1K 1J 1I FIND 1E 1D 1C 1B 1A
2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2C 2B 2A
3M 3L 3K 3J 3I 3H 3G 3F 3E 3D 3C 3B 3A
4M 4L 4K 4J 4I 4H 4G 4F 4E 4D 4C 4B 4A
420
422
424
PAUSED
RUN
PAUSE
440
440c
440a
440b

FIG. 9

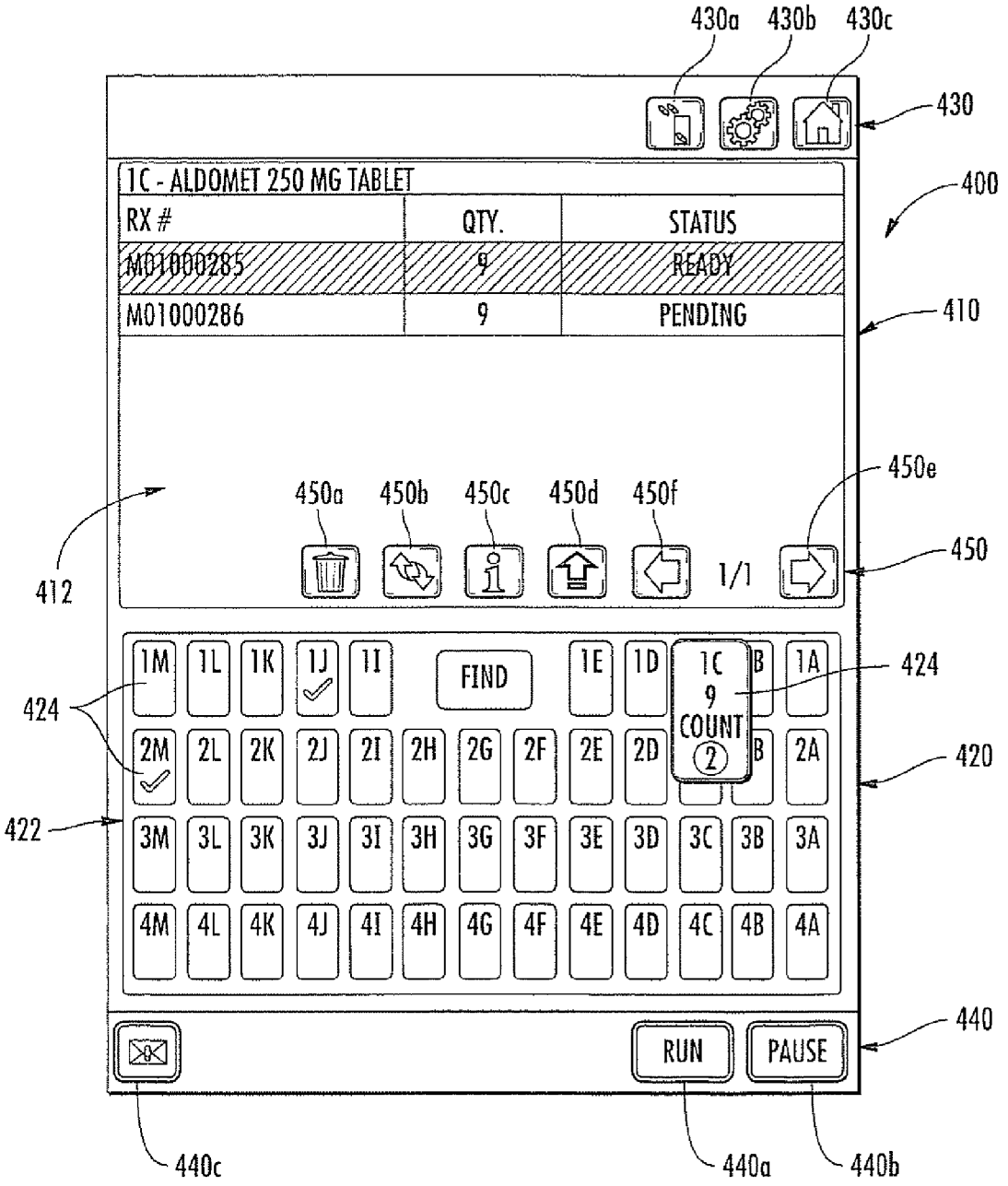

430a
430b
430c
430
400
1C - ALDOMET 250 MG TABLET
RX #
QTY.
STATUS
M01000285
9
READY
M01000286
9
PENDING
410
412
450a
450b
450c
450d
450f
450e
1/1
450
424
1M 1L 1K 1J 1I FIND 1E 1D 1C 9 COUNT 2 1B 1A
2M 2L 2K 2J 2I 2H 2G 2F 2E 2D 2B 2A
422
3M 3L 3K 3J 3I 3H 3G 3F 3E 3D 3C 3B 3A
4M 4L 4K 4J 4I 4H 4G 4F 4E 4D 4C 4B 4A
420
RUN
PAUSE
440
440c
440a
440b

FIG. 10

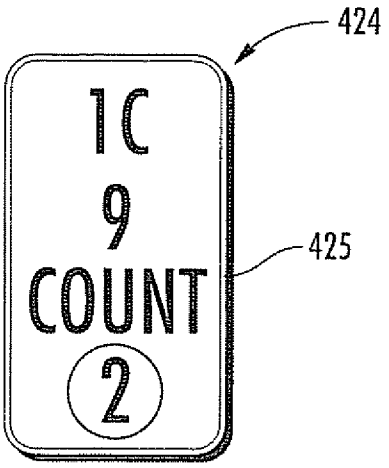


FIG. 11

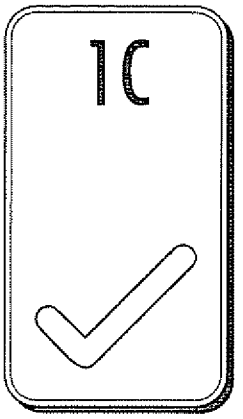


FIG. 12A

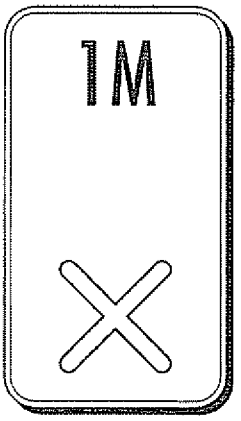
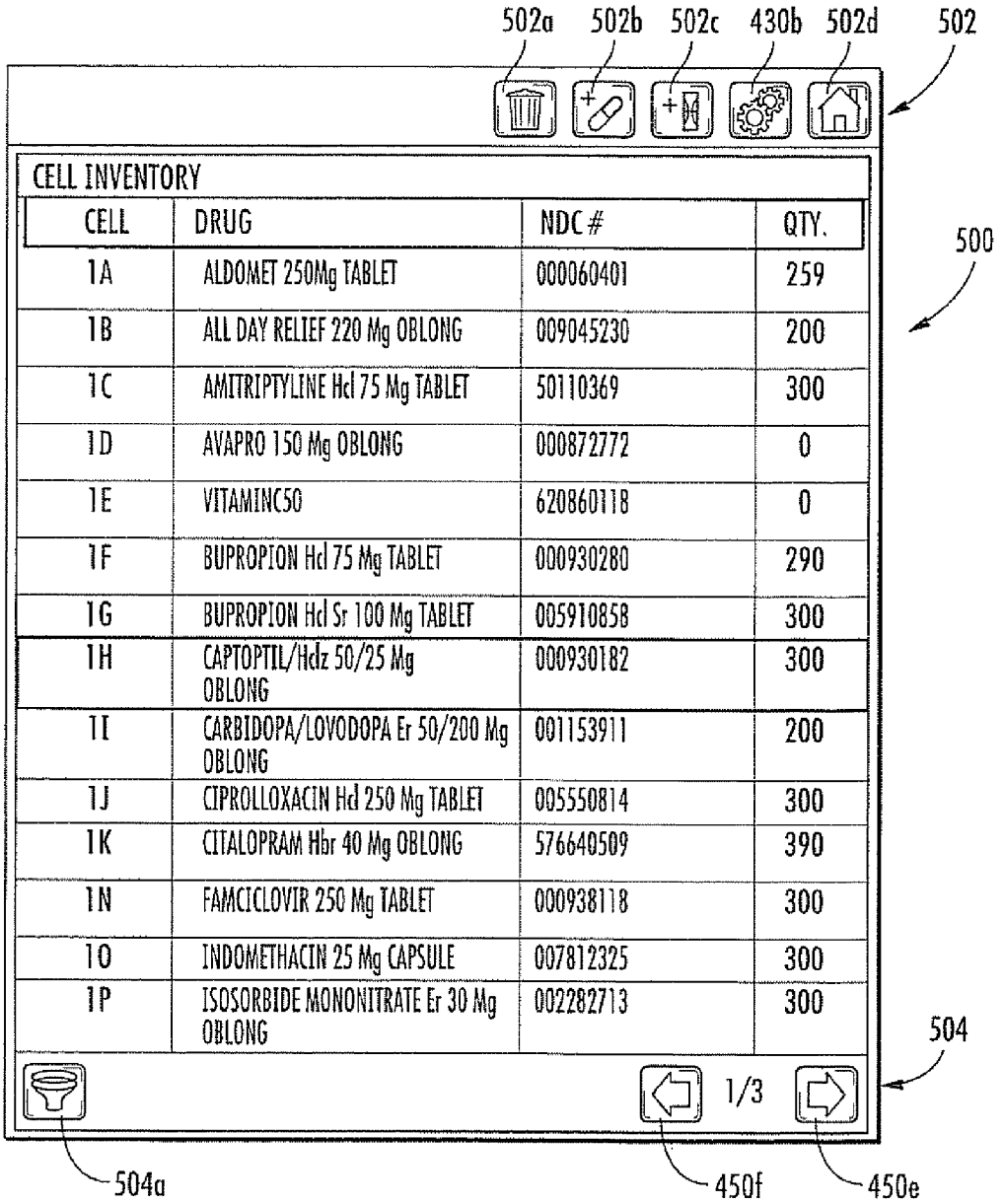


FIG. 12B



CELL INVENTORY

CELL	DRUG	NDC #	QTY.
1A	ALDOMET 250Mg TABLET	000060401	259
1B	ALL DAY RELIEF 220 Mg OBLONG	009045230	200
1C	AMITRIPTYLINE Hcl 75 Mg TABLET	50110369	300
1D	AVAPRO 150 Mg OBLONG	000872772	0
1E	VITAMINC50	620860118	0
1F	BUPROPION Hcl 75 Mg TABLET	000930280	290
1G	BUPROPION Hcl Sr 100 Mg TABLET	005910858	300
1H	CAPTOPTIL/Hdz 50/25 Mg OBLONG	000930182	300
1I	CARBIDOPA/LOVODOPA Er 50/200 Mg OBLONG	001153911	200
1J	CIPROLLOXACIN Hcl 250 Mg TABLET	005550814	300
1K	CITALOPRAM Hbr 40 Mg OBLONG	576640509	390
1N	FAMCICLOVIR 250 Mg TABLET	000938118	300
1O	INDOMETHACIN 25 Mg CAPSULE	007812325	300
1P	ISOSORBIDE MONONITRATE Er 30 Mg OBLONG	002282713	300

FIG. 13

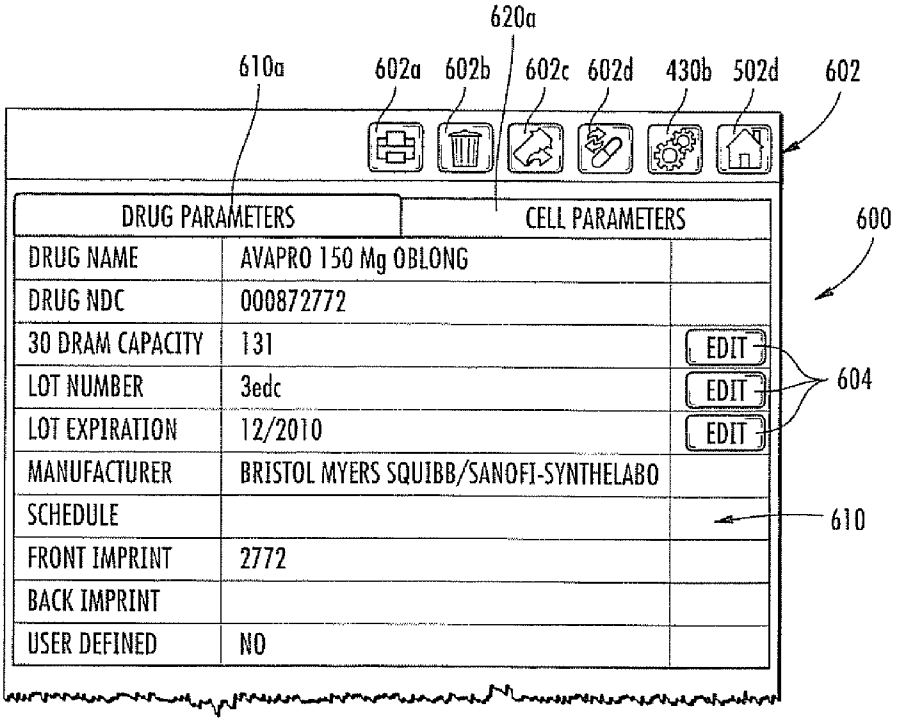

620a
610a
602a
602b
602c
602d
430b
502d
602
600
604
610
DRUG PARAMETERS
CELL PARAMETERS
DRUG NAME
AVAPRO 150 Mg OBLONG
DRUG NDC
000872772
30 DRAM CAPACITY
131
EDIT
LOT NUMBER
3edc
EDIT
LOT EXPIRATION
12/2010
EDIT
MANUFACTURER
BRISTOL MYERS SQUIBB/SANOFI-SYNTHELABO
SCHEDULE
FRONT IMPRINT
2772
BACK IMPRINT
USER DEFINED
NO

FIG. 14

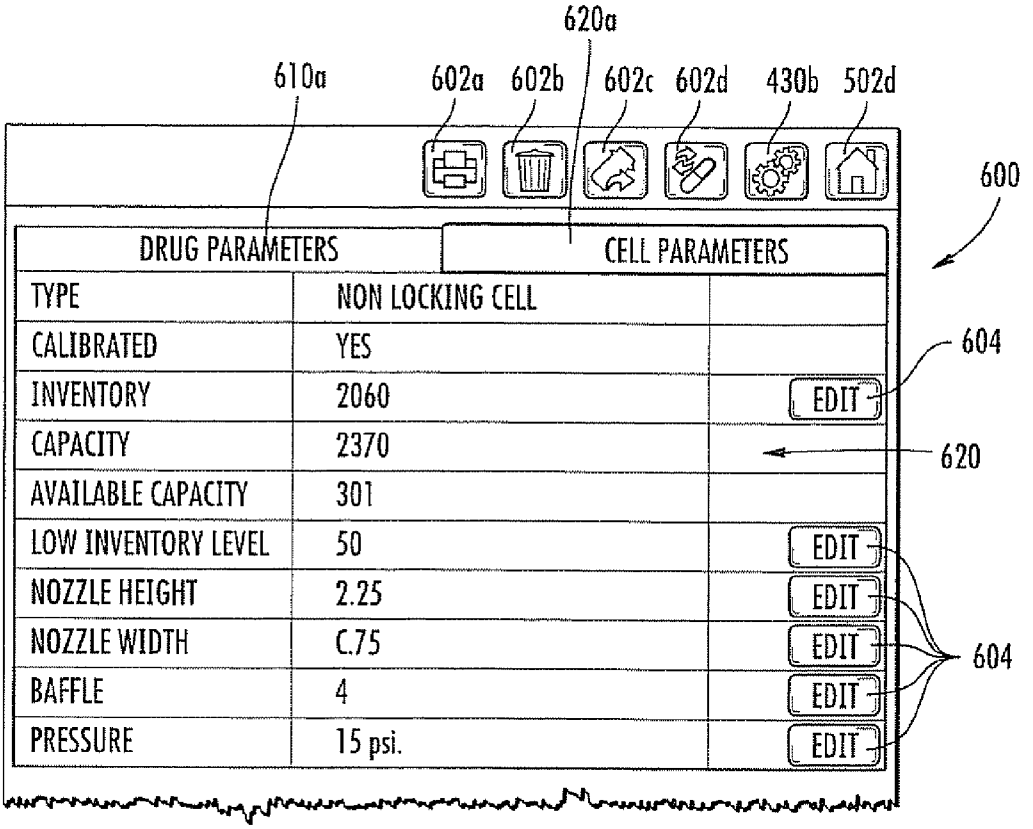

620a
610a
602a
602b
602c
602d
430b
502d
600
DRUG PARAMETERS
CELL PARAMETERS
TYPE
NON LOCKING CELL
CALIBRATED
YES
INVENTORY
2060
EDIT
604
CAPACITY
2370
620
AVAILABLE CAPACITY
301
LOW INVENTORY LEVEL
50
EDIT
NOZZLE HEIGHT
2.25
EDIT
NOZZLE WIDTH
C.75
EDIT
604
BAFFLE
4
EDIT
PRESSURE
15 psi.
EDIT

FIG. 15

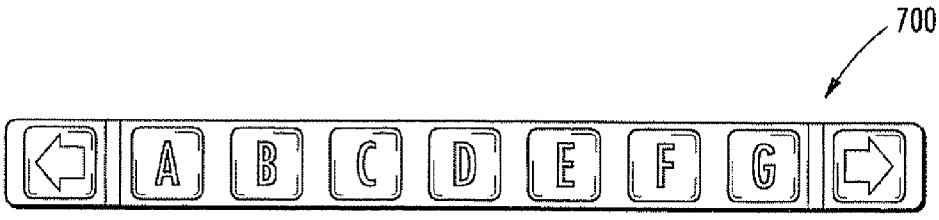

700
A
B
C
D
E
F
G

FIG. 16

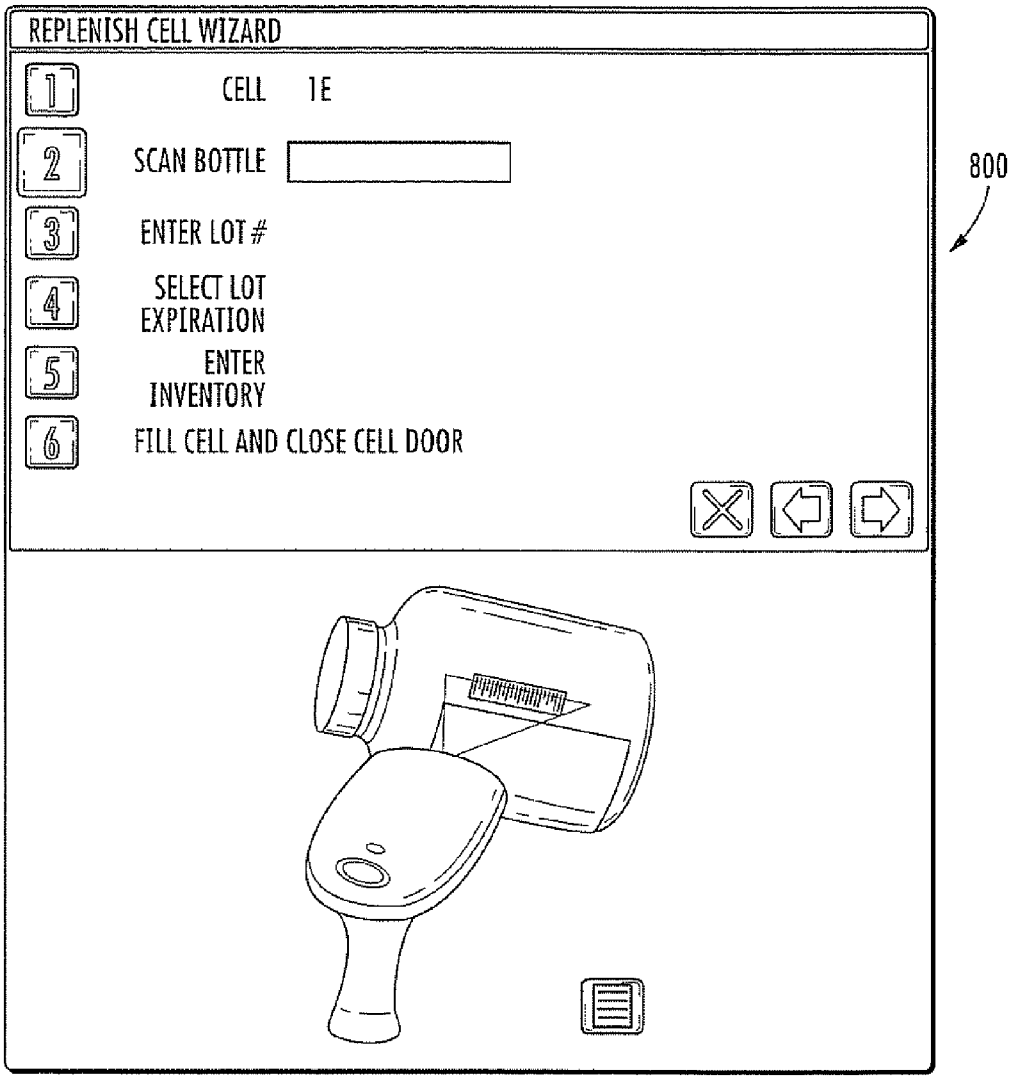

REPLENISH CELL WIZARD
1
CELL 1E
2
SCAN BOTTLE
3
ENTER LOT #
4
SELECT LOT EXPIRATION
5
ENTER INVENTORY
6
FILL CELL AND CLOSE CELL DOOR
800

FIG. 17A

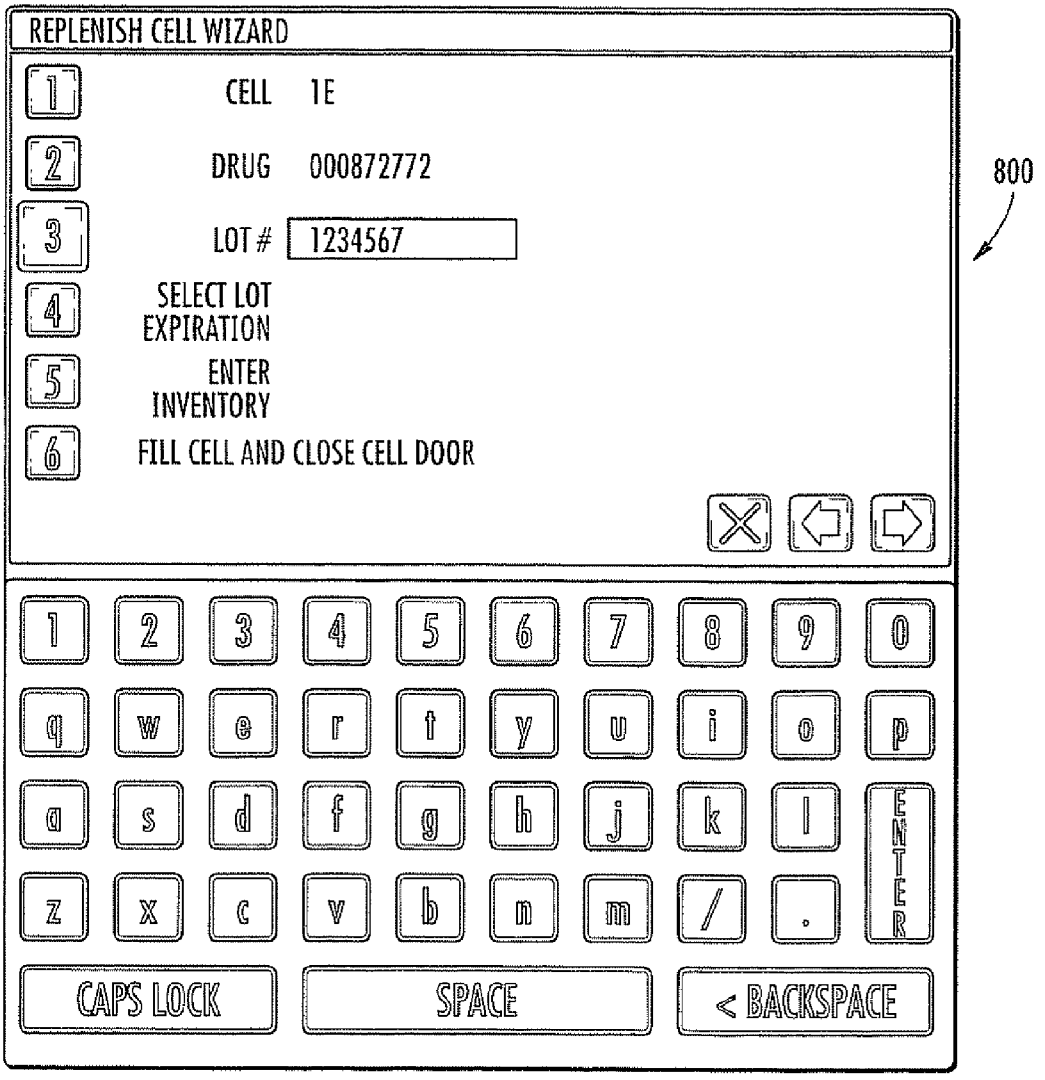

REPLENISH CELL WIZARD
1
CELL 1E
2
DRUG 000872772
3
LOT # 1234567
4
SELECT LOT EXPIRATION
5
ENTER INVENTORY
6
FILL CELL AND CLOSE CELL DOOR
800
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p
a s d f g h j k l
z x c v b n m / .
ENTER
CAPS LOCK
SPACE
< BACKSPACE

FIG. 17B

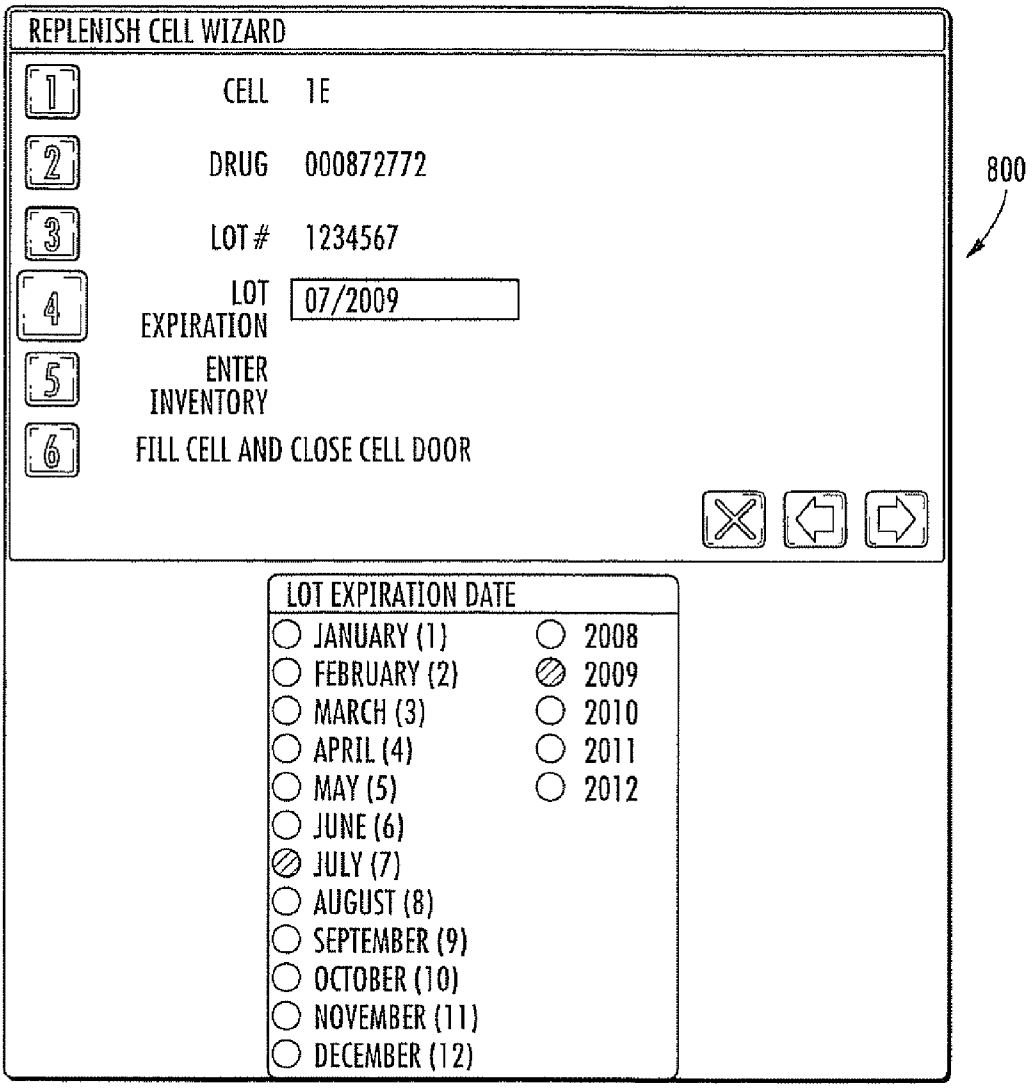

REPLENISH CELL WIZARD
1
CELL 1E
2
DRUG 000872772
3
LOT # 1234567
4
LOT EXPIRATION 07/2009
5
ENTER INVENTORY
6
FILL CELL AND CLOSE CELL DOOR
800
LOT EXPIRATION DATE
JANUARY (1)
FEBRUARY (2)
MARCH (3)
APRIL (4)
MAY (5)
JUNE (6)
JULY (7)
AUGUST (8)
SEPTEMBER (9)
OCTOBER (10)
NOVEMBER (11)
DECEMBER (12)
2008
2009
2010
2011
2012

FIG. 17C

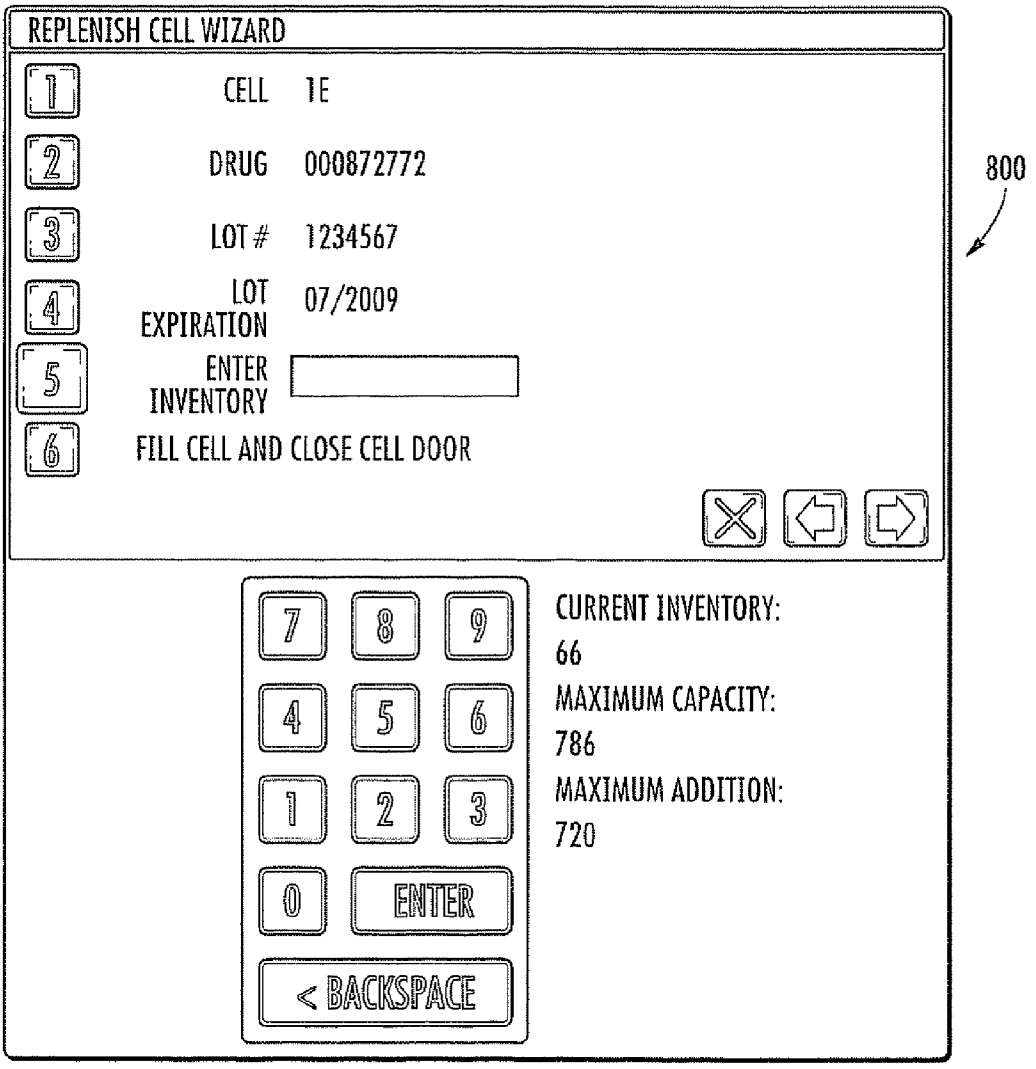

REPLENISH CELL WIZARD
1
CELL 1E
2
DRUG 000872772
3
LOT # 1234567
4
LOT EXPIRATION 07/2009
5
ENTER INVENTORY
6
FILL CELL AND CLOSE CELL DOOR
800
7 8 9
4 5 6
1 2 3
0 ENTER
< BACKSPACE
CURRENT INVENTORY:
66
MAXIMUM CAPACITY:
786
MAXIMUM ADDITION:
720

FIG. 17D

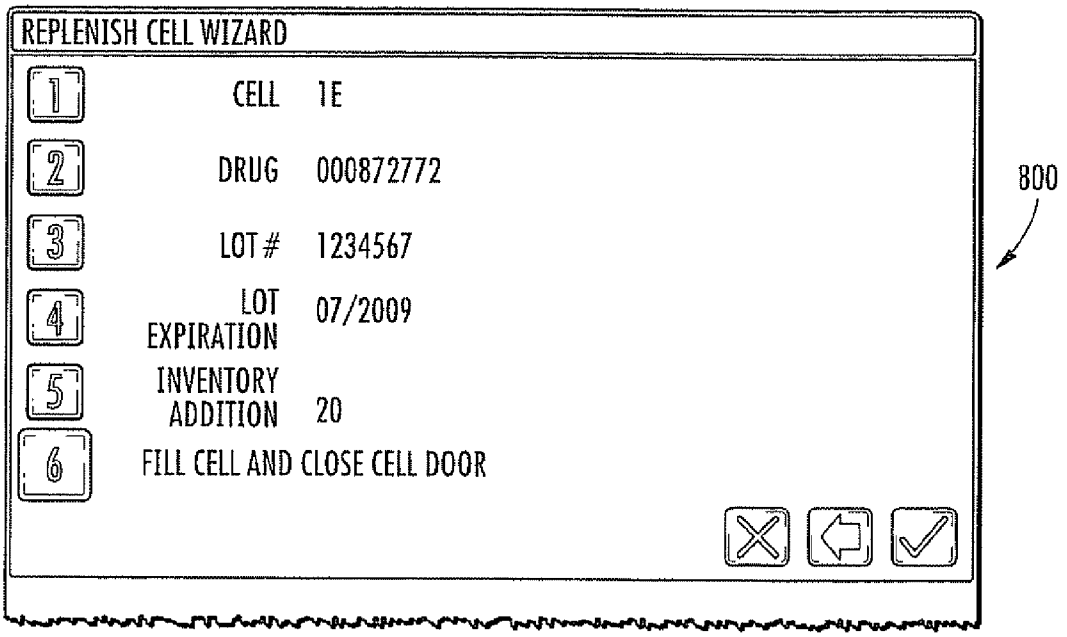

REPLENISH CELL WIZARD
1
CELL 1E
2
DRUG 000872772
3
LOT # 1234567
4
LOT EXPIRATION 07/2009
5
INVENTORY ADDITION 20
6
FILL CELL AND CLOSE CELL DOOR
800

FIG. 17E

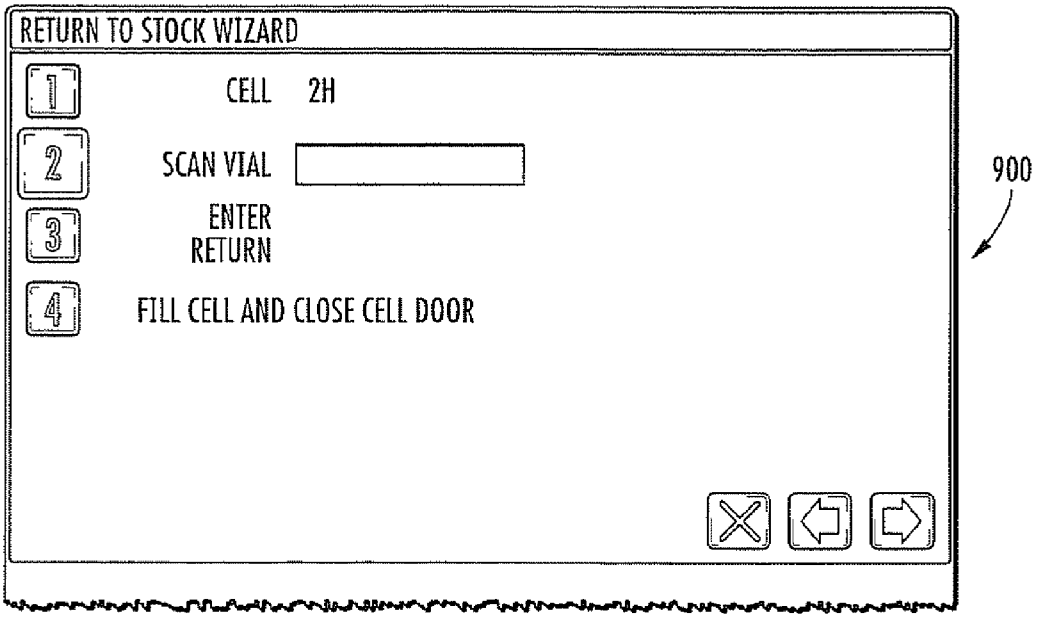

RETURN TO STOCK WIZARD
1
CELL 2H
2
SCAN VIAL
3
ENTER
RETURN
4
FILL CELL AND CLOSE CELL DOOR
900

FIG. 18A

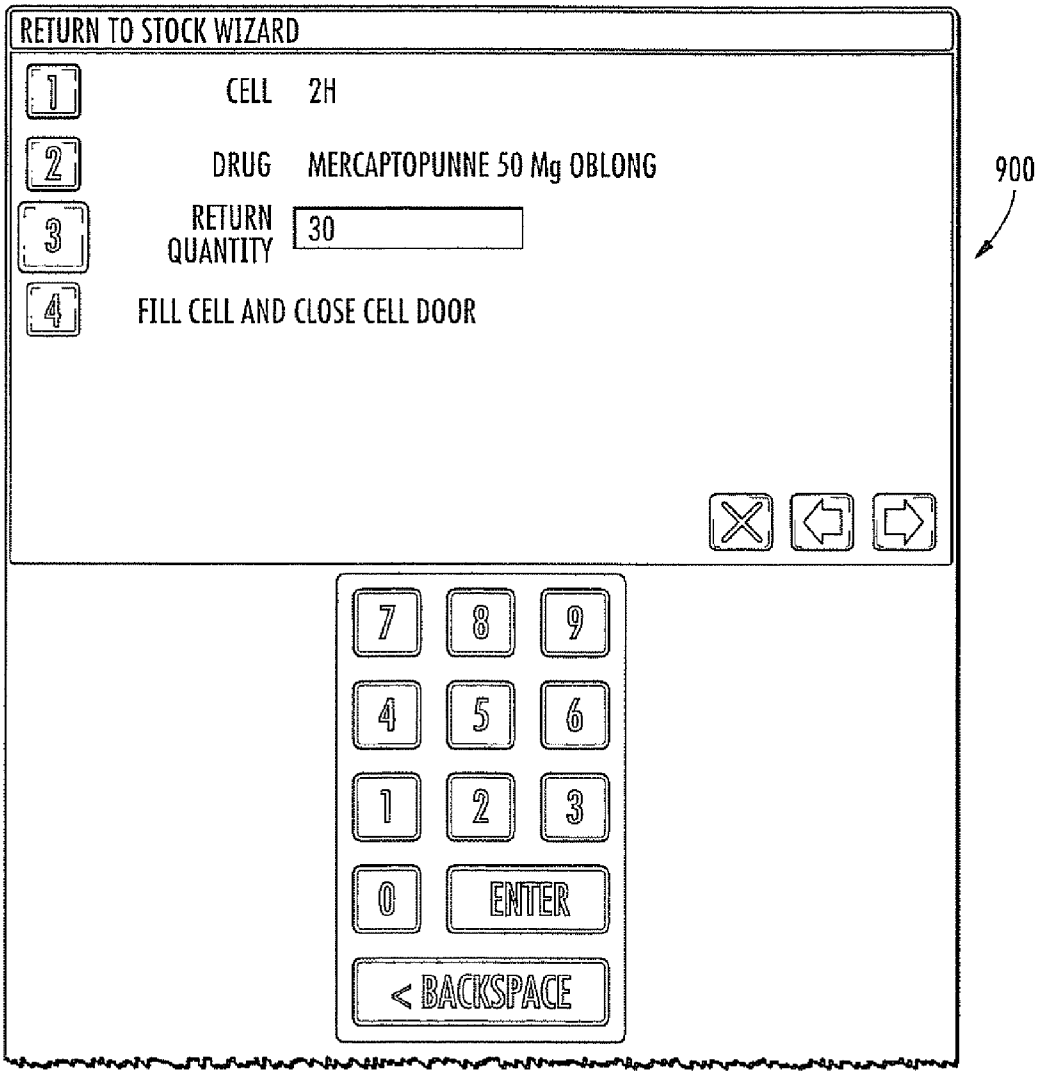

RETURN TO STOCK WIZARD
1
CELL 2H
2
DRUG MERCAPTOPUNNE 50 Mg OBLONG
3
RETURN QUANTITY
30
4
FILL CELL AND CLOSE CELL DOOR
900
7
8
9
4
5
6
1
2
3
0
ENTER
< BACKSPACE

FIG. 18B

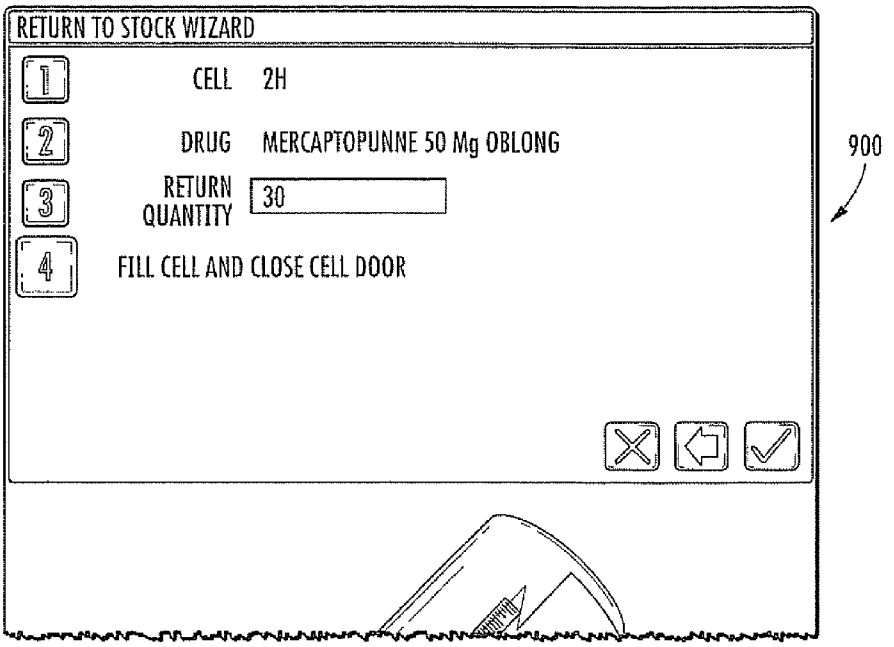

RETURN TO STOCK WIZARD
1
CELL 2H
2
DRUG MERCAPTOPUNNE 50 Mg OBLONG
3
RETURN QUANTITY 30
4
FILL CELL AND CLOSE CELL DOOR
900

FIG. 18C

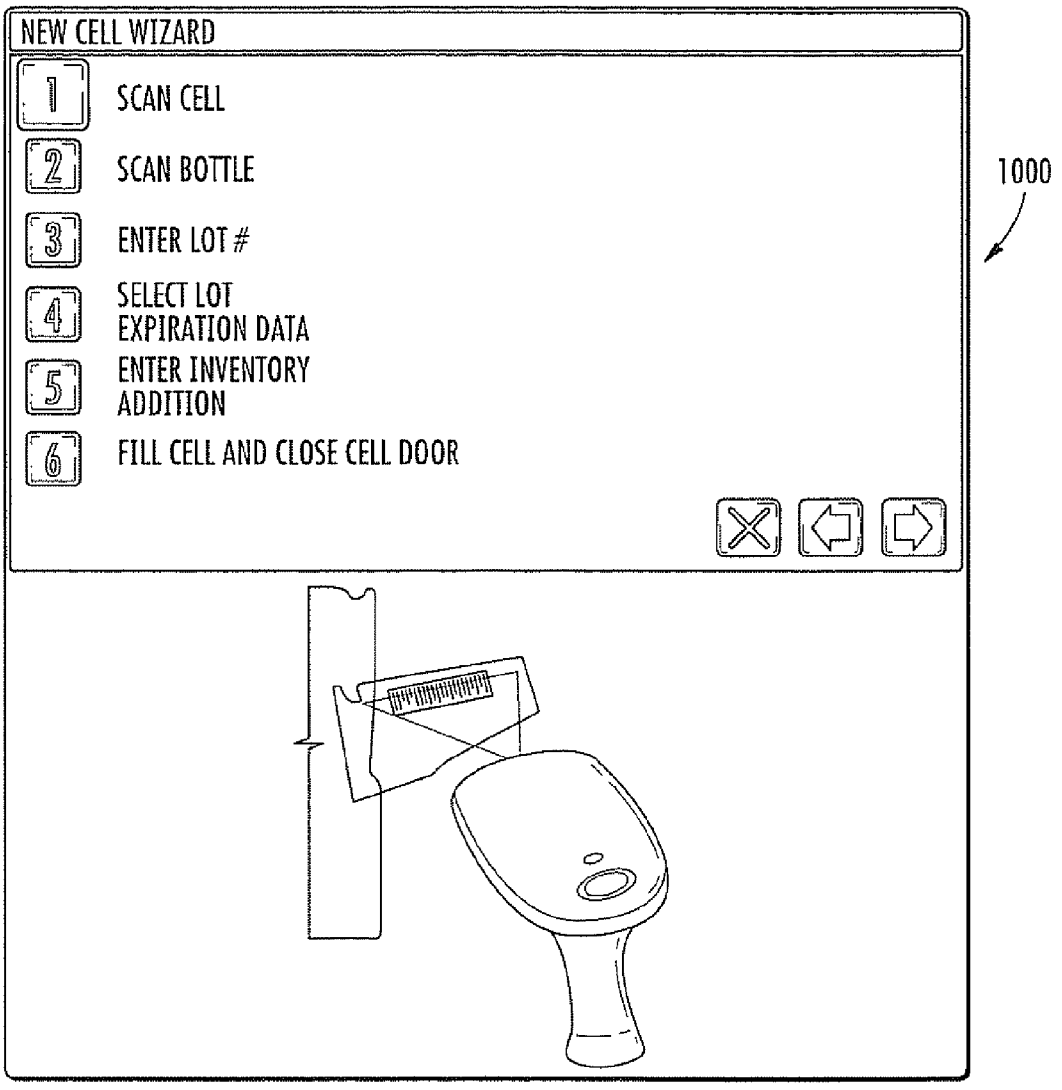

NEW CELL WIZARD
1
SCAN CELL
2
SCAN BOTTLE
3
ENTER LOT #
4
SELECT LOT EXPIRATION DATA
5
ENTER INVENTORY ADDITION
6
FILL CELL AND CLOSE CELL DOOR
1000

FIG. 19A

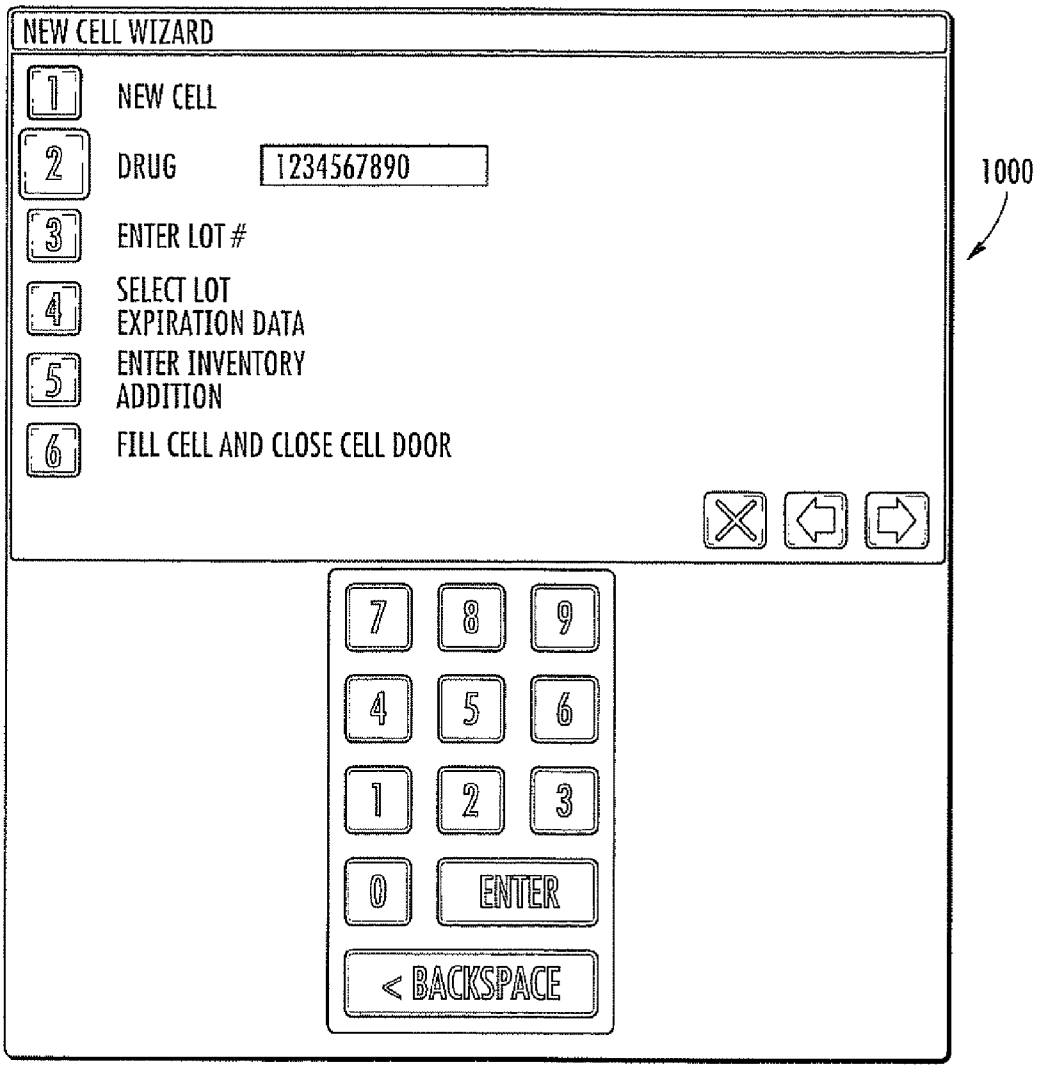

NEW CELL WIZARD
1
NEW CELL
2
DRUG
1234567890
3
ENTER LOT #
4
SELECT LOT EXPIRATION DATA
5
ENTER INVENTORY ADDITION
6
FILL CELL AND CLOSE CELL DOOR
7
8
9
4
5
6
1
2
3
0
ENTER
< BACKSPACE
1000

FIG. 19B

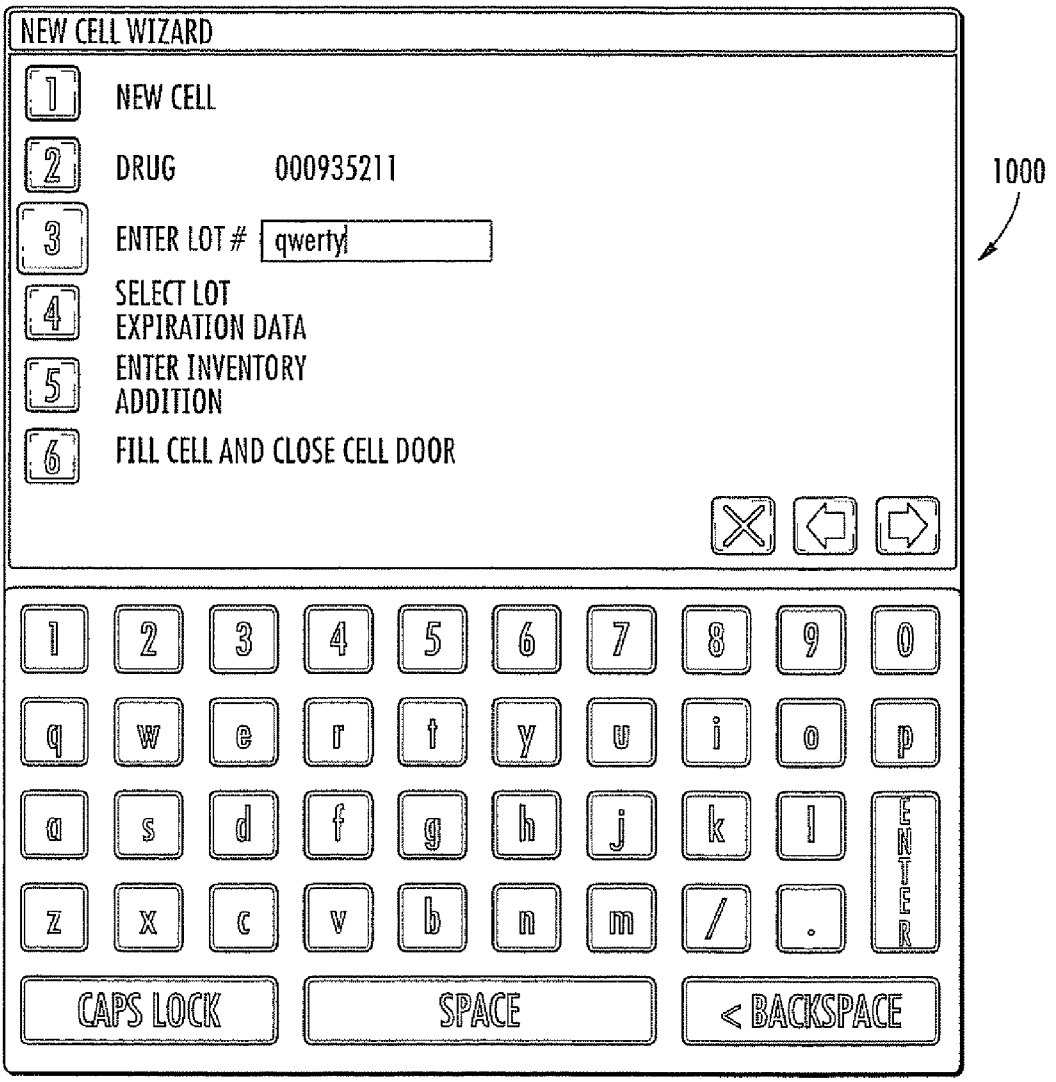

NEW CELL WIZARD
1
NEW CELL
2
DRUG 000935211
3
ENTER LOT # qwerty
4
SELECT LOT EXPIRATION DATA
5
ENTER INVENTORY ADDITION
6
FILL CELL AND CLOSE CELL DOOR
1000
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p
a s d f g h j k l
z x c v b n m / .
ENTER
CAPS LOCK
SPACE
< BACKSPACE

FIG. 19C

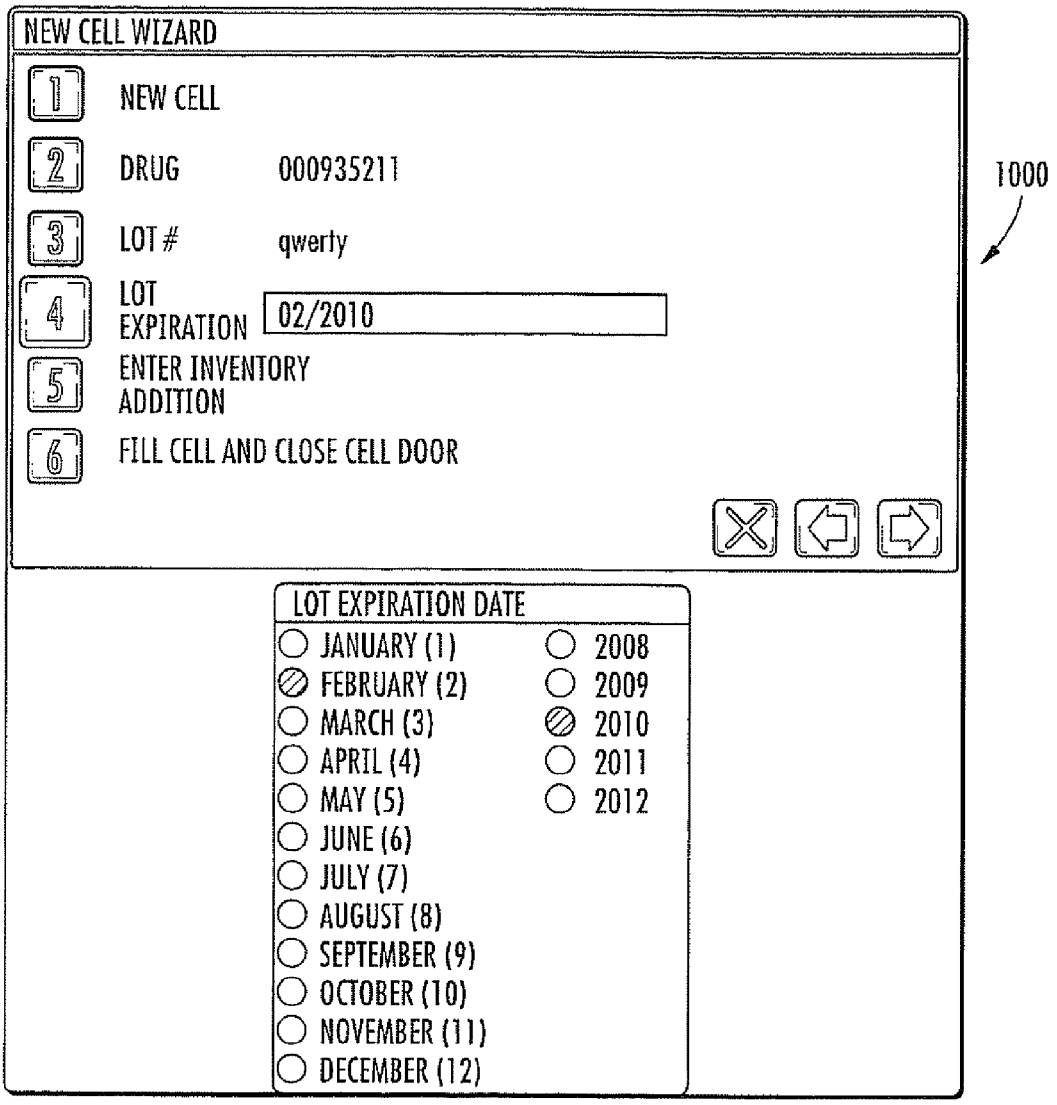

NEW CELL WIZARD
1
NEW CELL
2
DRUG
000935211
3
LOT #
qwerty
4
LOT EXPIRATION
02/2010
5
ENTER INVENTORY ADDITION
6
FILL CELL AND CLOSE CELL DOOR
1000
LOT EXPIRATION DATE
JANUARY (1)
FEBRUARY (2)
MARCH (3)
APRIL (4)
MAY (5)
JUNE (6)
JULY (7)
AUGUST (8)
SEPTEMBER (9)
OCTOBER (10)
NOVEMBER (11)
DECEMBER (12)
2008
2009
2010
2011
2012

FIG. 19D

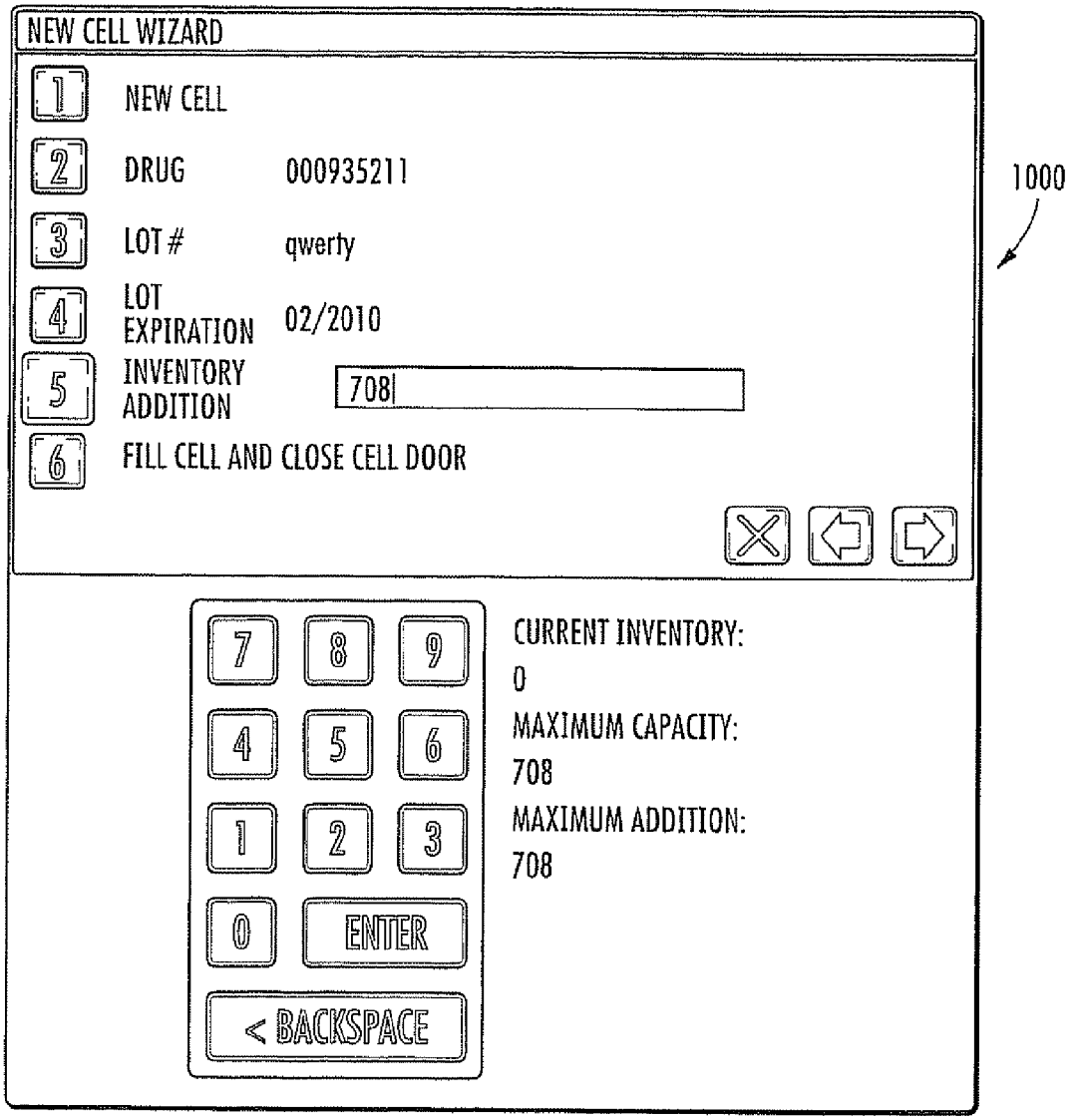

NEW CELL WIZARD
1
NEW CELL
2
DRUG
000935211
3
LOT #
qwerty
4
LOT EXPIRATION
02/2010
5
INVENTORY ADDITION
708
6
FILL CELL AND CLOSE CELL DOOR
7
8
9
4
5
6
1
2
3
0
ENTER
< BACKSPACE
CURRENT INVENTORY:
0
MAXIMUM CAPACITY:
708
MAXIMUM ADDITION:
708
1000

FIG. 19E

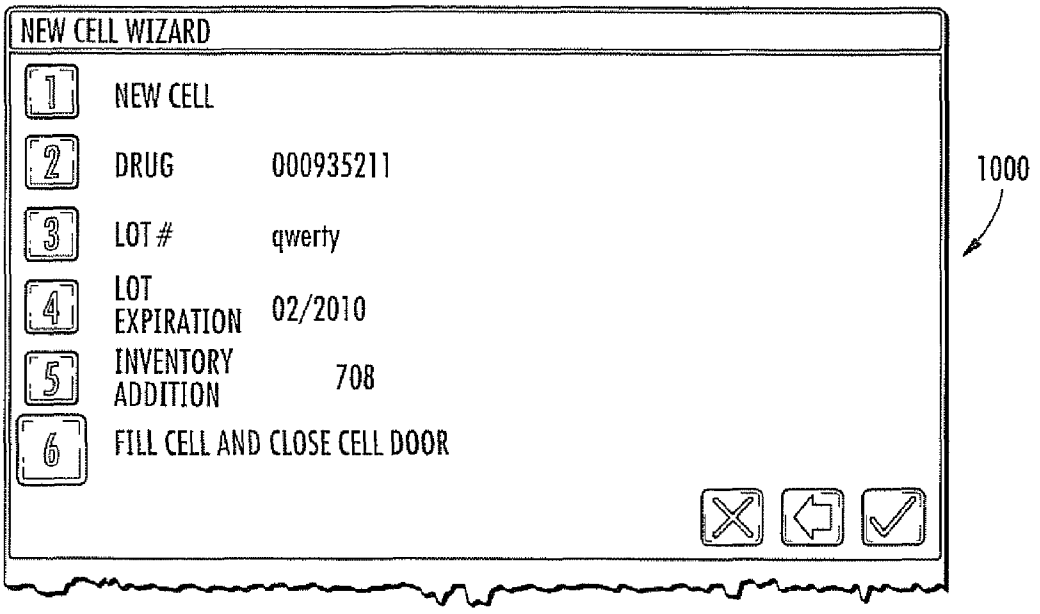

NEW CELL WIZARD
1
NEW CELL
2
DRUG
000935211
3
LOT #
qwerty
4
LOT EXPIRATION
02/2010
5
INVENTORY ADDITION
708
6
FILL CELL AND CLOSE CELL DOOR
1000

FIG. 19F

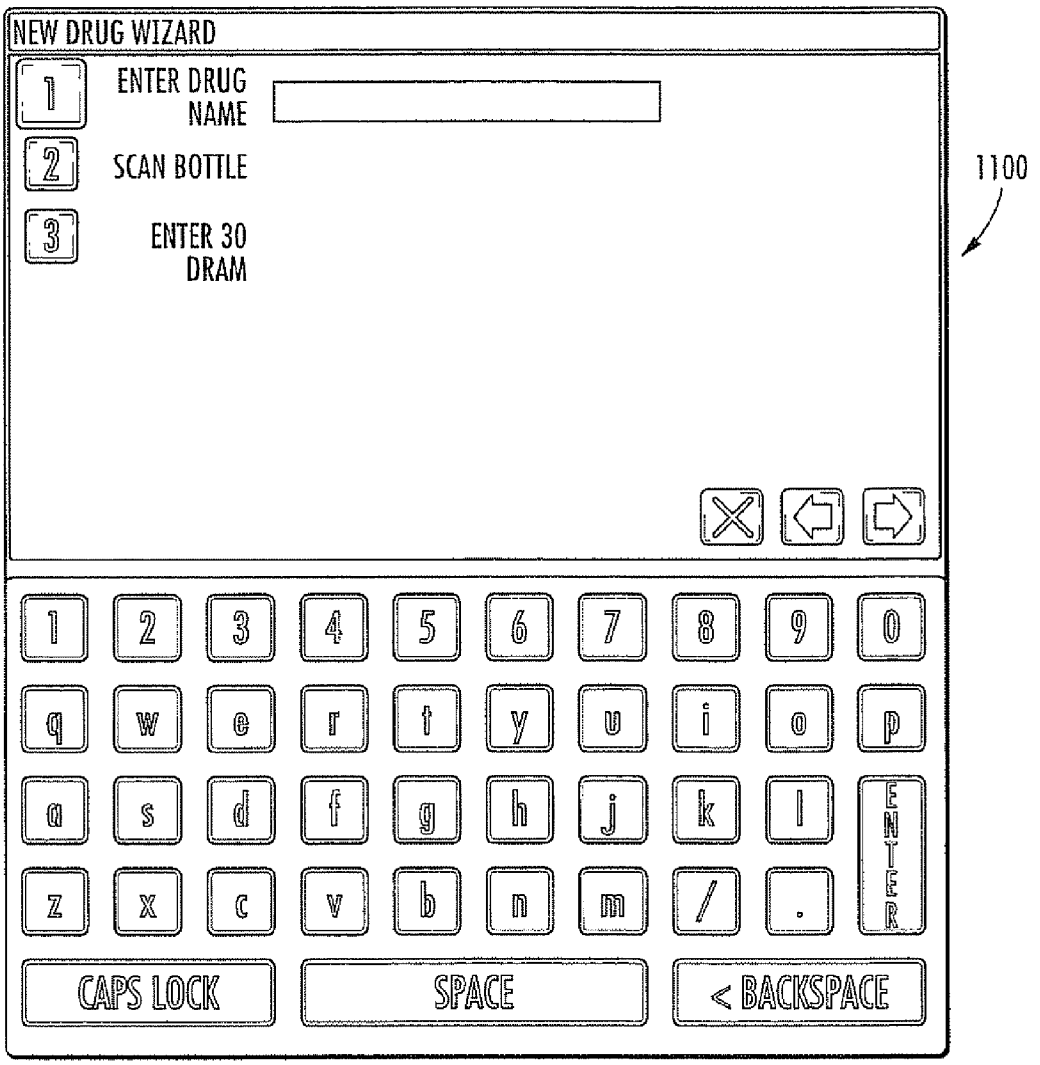

NEW DRUG WIZARD
1
ENTER DRUG NAME
2
SCAN BOTTLE
3
ENTER 30 DRAM
1100
1 2 3 4 5 6 7 8 9 0
q w e r t y u i o p
a s d f g h j k l
ENTER
z x c v b n m / .
CAPS LOCK
SPACE
< BACKSPACE

FIG. 20A

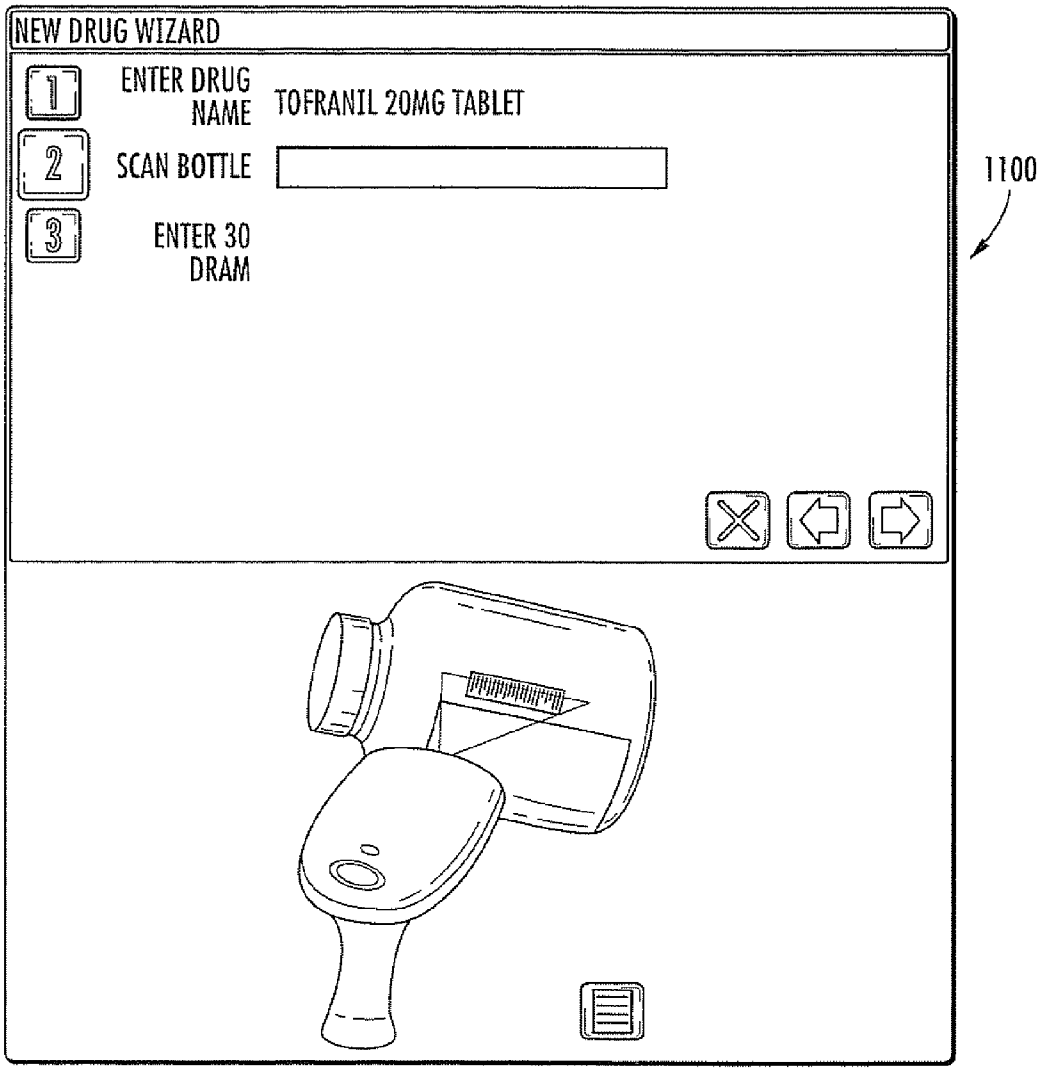

NEW DRUG WIZARD
1
ENTER DRUG NAME
TOFRANIL 20MG TABLET
2
SCAN BOTTLE
3
ENTER 30 DRAM
1100

FIG. 20B

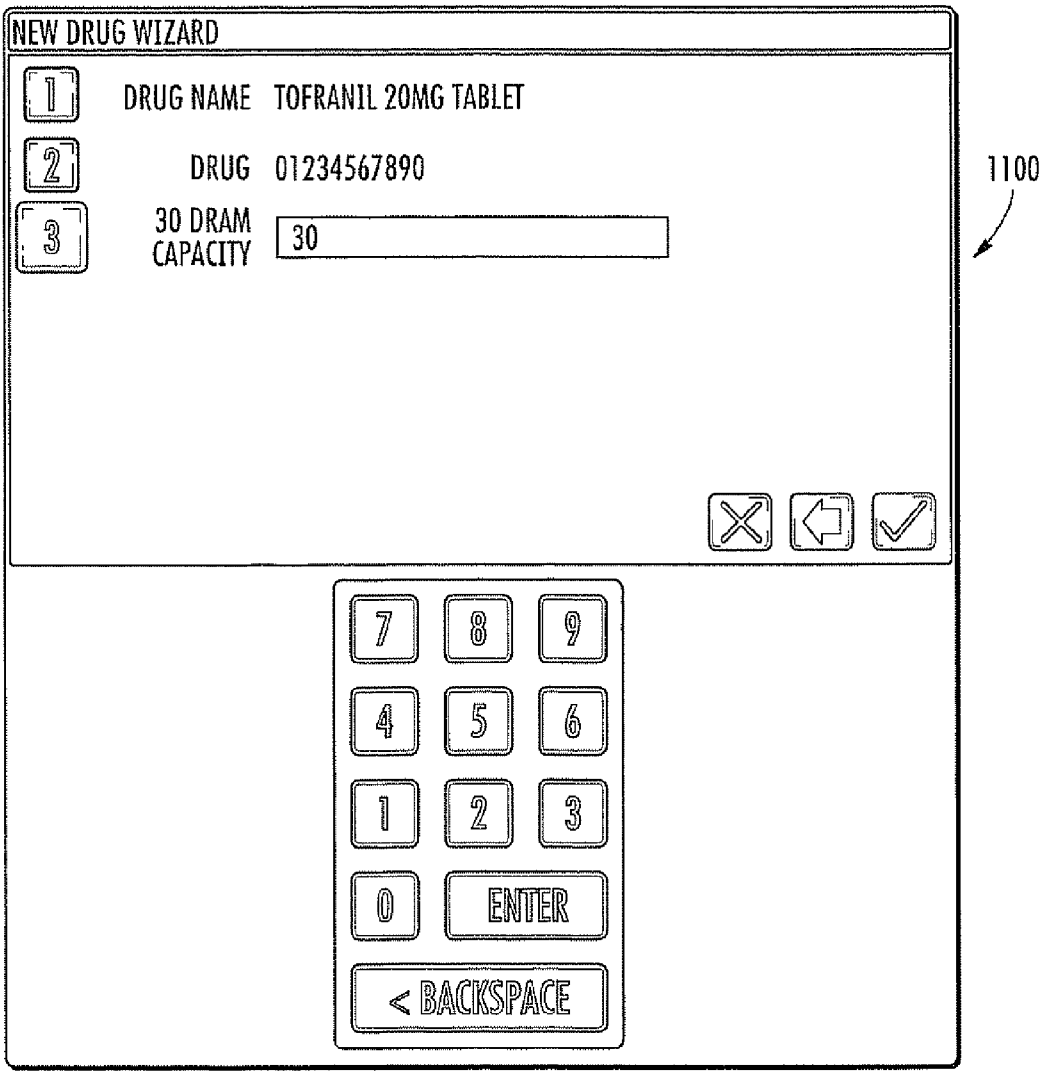

NEW DRUG WIZARD
1
DRUG NAME TOFRANIL 20MG TABLET
2
DRUG 01234567890
3
30 DRAM CAPACITY
30
1100
7
8
9
4
5
6
1
2
3
0
ENTER
< BACKSPACE

FIG. 20C

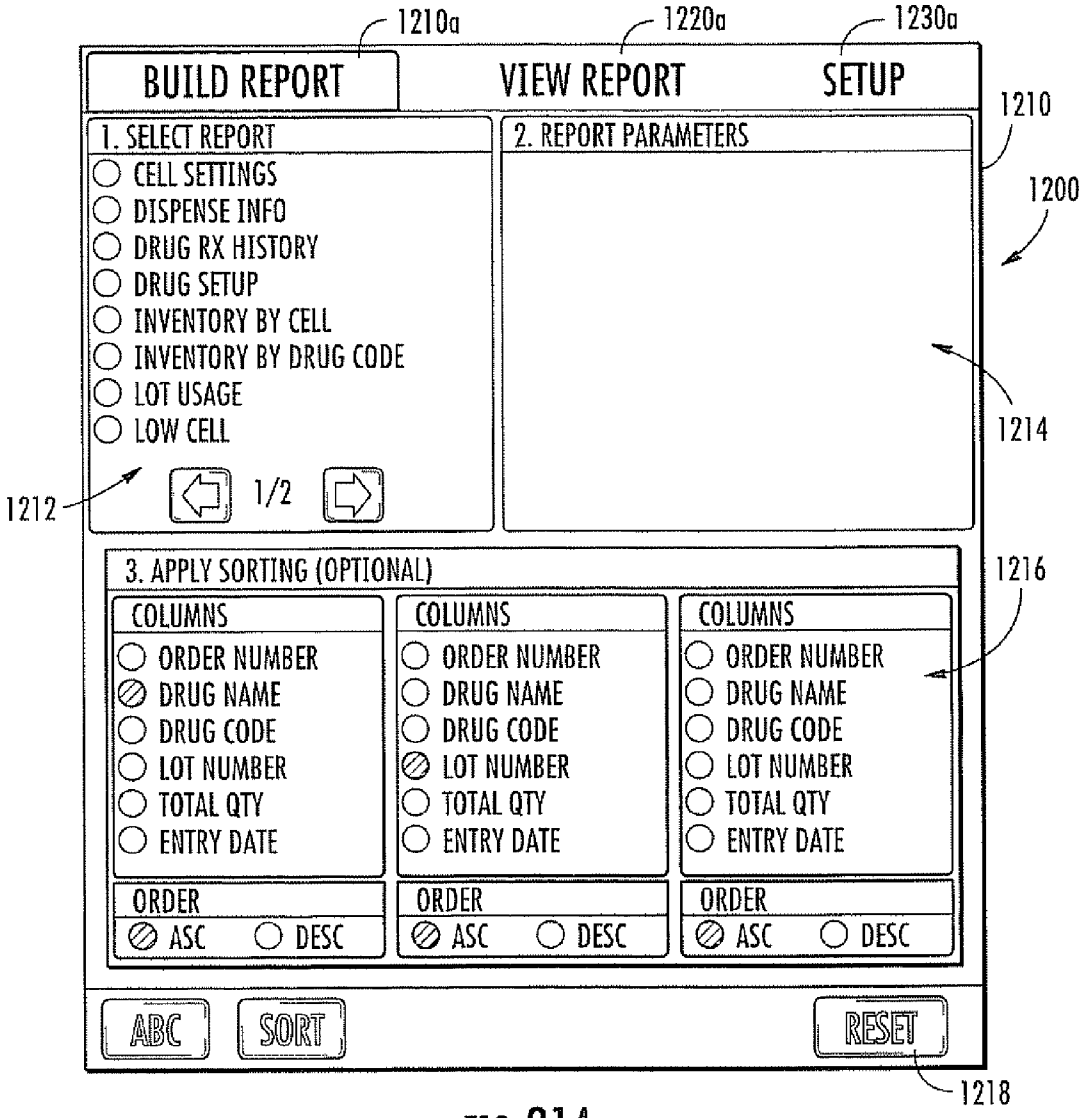

1210a
1220a
1230a
BUILD REPORT
VIEW REPORT
SETUP
1210
1200
1. SELECT REPORT
CELL SETTINGS
DISPENSE INFO
DRUG RX HISTORY
DRUG SETUP
INVENTORY BY CELL
INVENTORY BY DRUG CODE
LOT USAGE
LOW CELL
1/2
1212
2. REPORT PARAMETERS
1214
3. APPLY SORTING (OPTIONAL)
1216
COLUMNS
ORDER NUMBER
DRUG NAME
DRUG CODE
LOT NUMBER
TOTAL QTY
ENTRY DATE
ORDER
ASC
DESC
ABC
SORT
RESET
1218

FIG. 21A

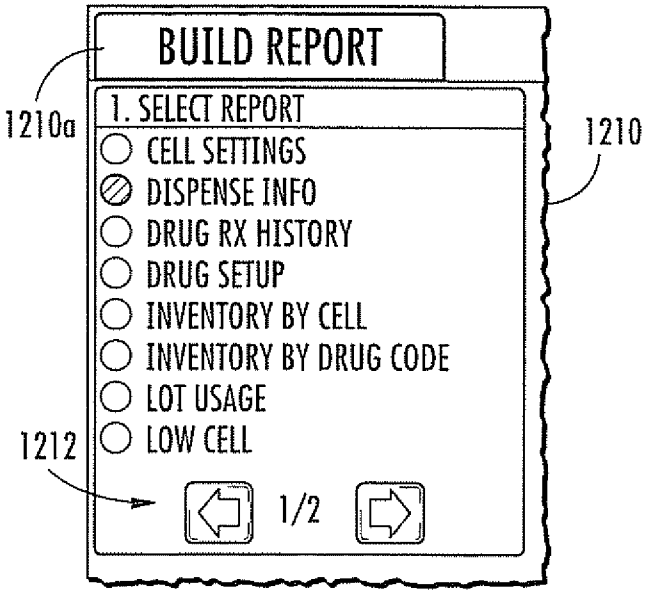

BUILD REPORT
1. SELECT REPORT
CELL SETTINGS
DISPENSE INFO
DRUG RX HISTORY
DRUG SETUP
INVENTORY BY CELL
INVENTORY BY DRUG CODE
LOT USAGE
LOW CELL
1/2
1210a
1210
1212

FIG. 21B

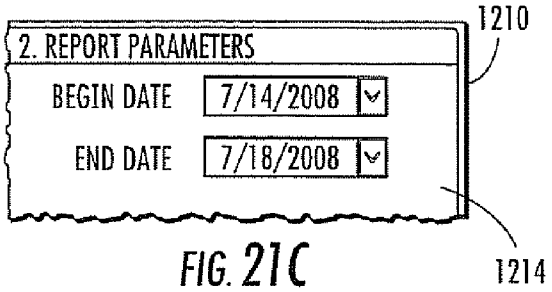


FIG. 21C

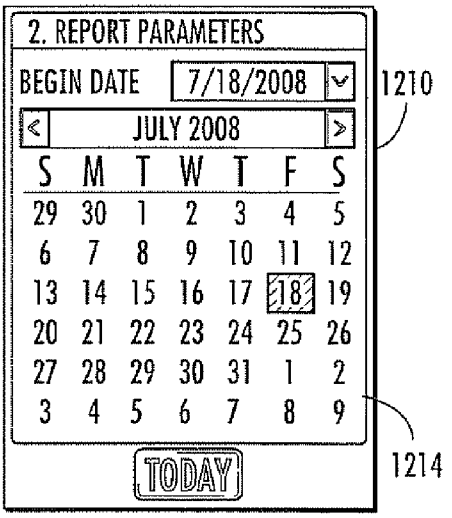


FIG. 21D

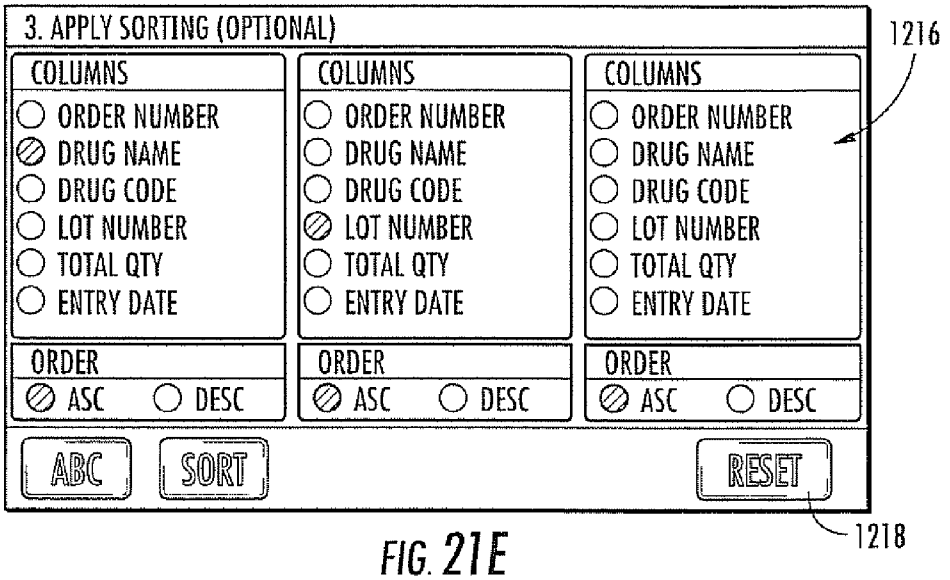


FIG. 21E

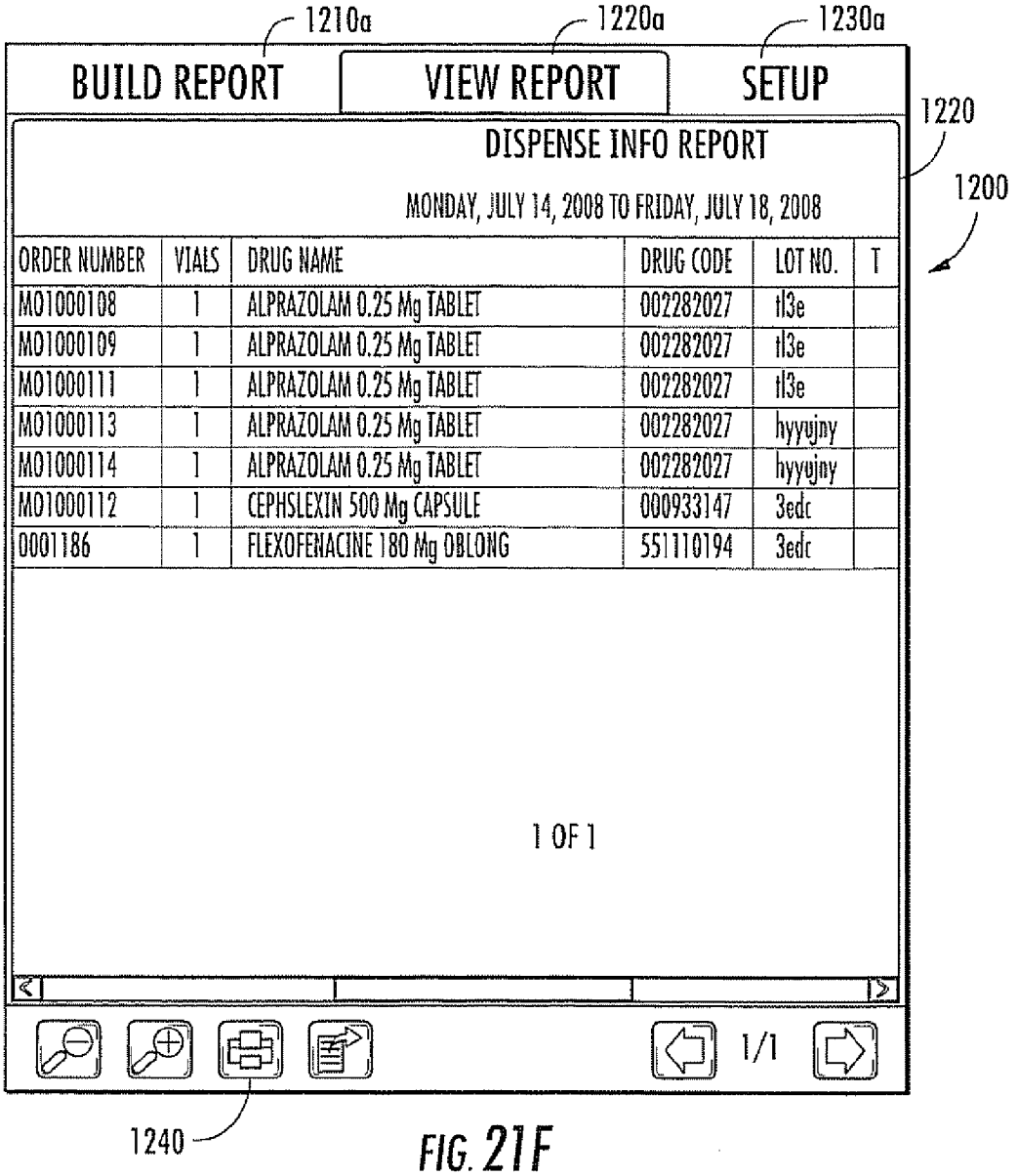

1210a
1220a
1230a
BUILD REPORT
VIEW REPORT
SETUP
1220
1200
DISPENSE INFO REPORT
MONDAY, JULY 14, 2008 TO FRIDAY, JULY 18, 2008
ORDER NUMBER | VIALS | DRUG NAME | DRUG CODE | LOT NO. | T
M01000108 | 1 | ALPRAZOLAM 0.25 Mg TABLET | 002282027 | tl3e |
M01000109 | 1 | ALPRAZOLAM 0.25 Mg TABLET | 002282027 | tl3e |
M01000111 | 1 | ALPRAZOLAM 0.25 Mg TABLET | 002282027 | tl3e |
M01000113 | 1 | ALPRAZOLAM 0.25 Mg TABLET | 002282027 | hyyujny |
M01000114 | 1 | ALPRAZOLAM 0.25 Mg TABLET | 002282027 | hyyujny |
M01000112 | 1 | CEPHSLEXIN 500 Mg CAPSULE | 000933147 | 3edc |
0001186 | 1 | FLEXOFENACINE 180 Mg OBLONG | 551110194 | 3edc |
1 OF 1
1/1
1240

FIG. 21F

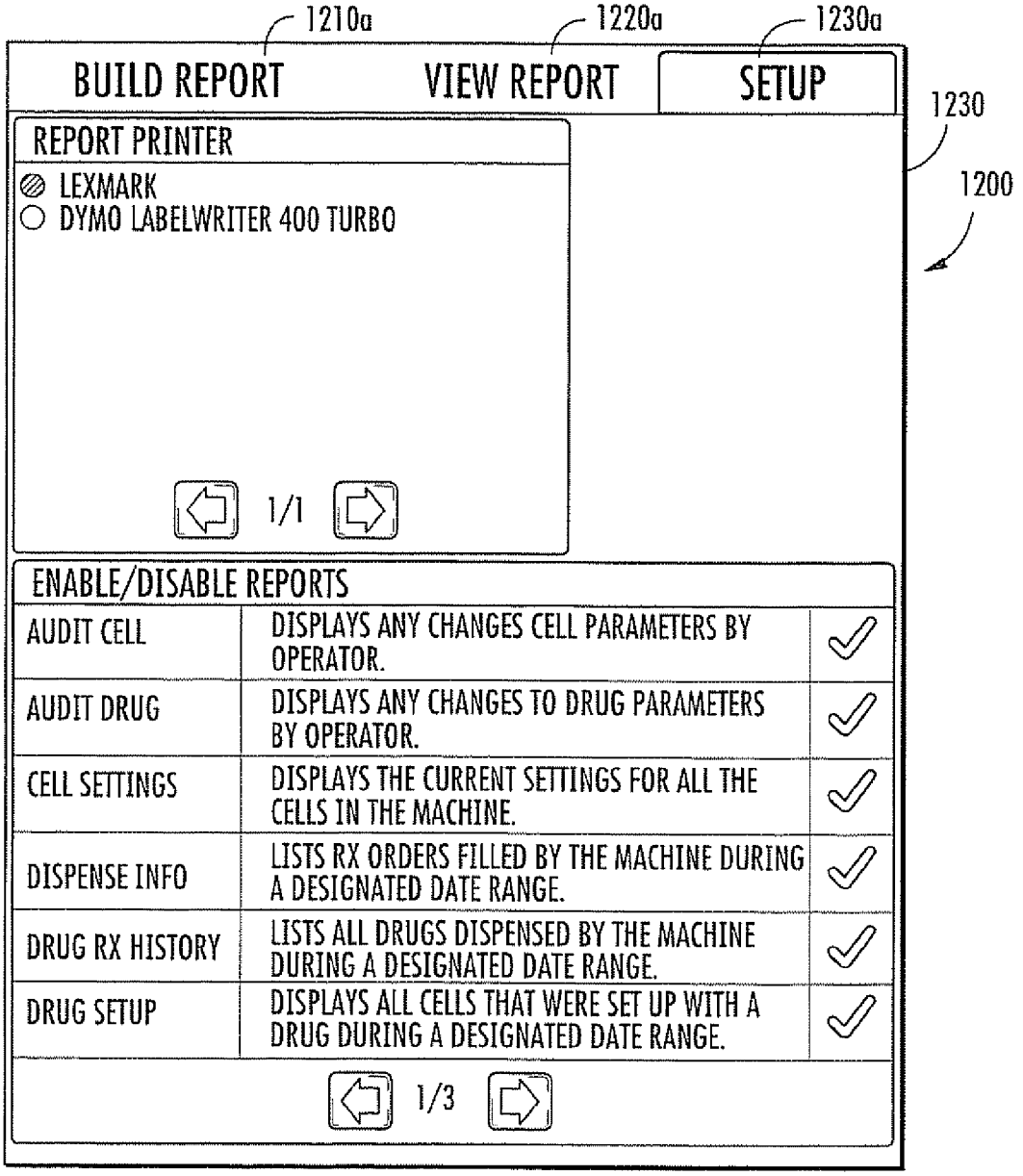

1210a
1220a
1230a
BUILD REPORT
VIEW REPORT
SETUP
1230
1200
REPORT PRINTER
LEXMARK
DYMO LABELWRITER 400 TURBO
1/1
ENABLE/DISABLE REPORTS
AUDIT CELL
DISPLAYS ANY CHANGES CELL PARAMETERS BY OPERATOR.
AUDIT DRUG
DISPLAYS ANY CHANGES TO DRUG PARAMETERS BY OPERATOR.
CELL SETTINGS
DISPLAYS THE CURRENT SETTINGS FOR ALL THE CELLS IN THE MACHINE.
DISPENSE INFO
LISTS RX ORDERS FILLED BY THE MACHINE DURING A DESIGNATED DATE RANGE.
DRUG RX HISTORY
LISTS ALL DRUGS DISPENSED BY THE MACHINE DURING A DESIGNATED DATE RANGE.
DRUG SETUP
DISPLAYS ALL CELLS THAT WERE SET UP WITH A DRUG DURING A DESIGNATED DATE RANGE.
1/3

FIG. 21G

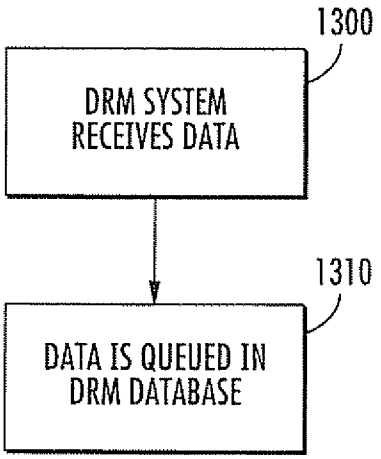

1300
DRM SYSTEM RECEIVES DATA
1310
DATA IS QUEUED IN DRM DATABASE

FIG. 22

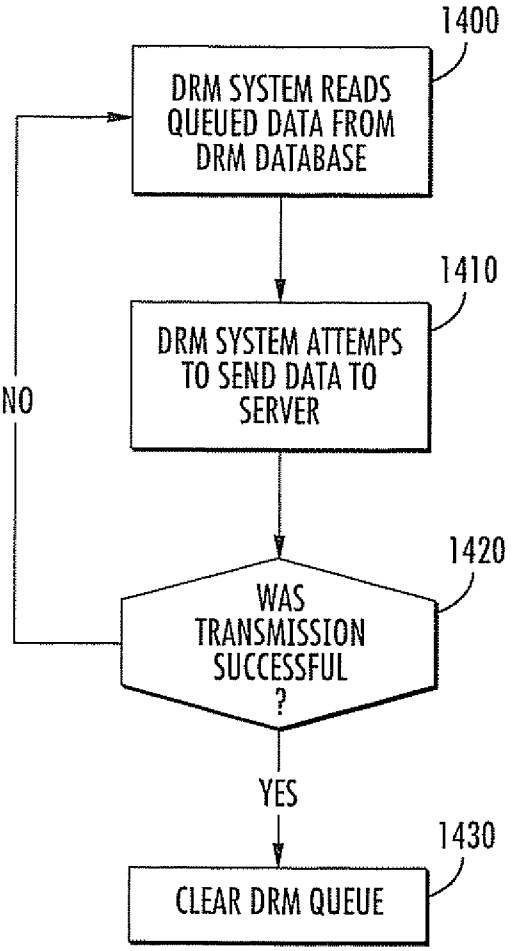

1400
DRM SYSTEM READS QUEUED DATA FROM DRM DATABASE
1410
DRM SYSTEM ATTEMPS TO SEND DATA TO SERVER
NO
1420
WAS TRANSMISSION SUCCESSFUL ?
YES
1430
CLEAR DRM QUEUE

FIG. 23

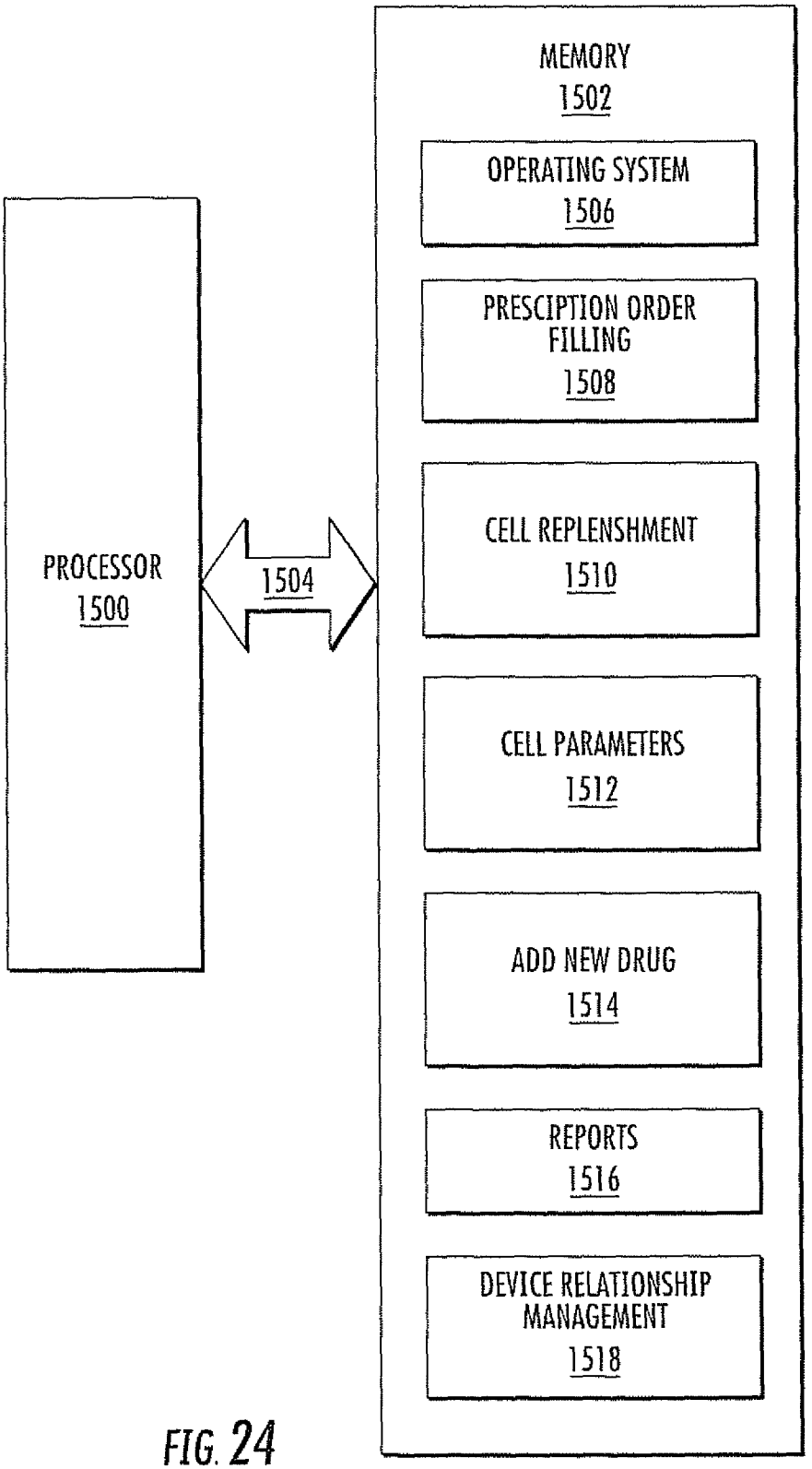

MEMORY
1502
OPERATING SYSTEM
1506
PRESCIPTION ORDER FILLING
1508
CELL REPLENSHMENT
1510
CELL PARAMETERS
1512
ADD NEW DRUG
1514
REPORTS
1516
DEVICE RELATIONSHIP MANAGEMENT
1518
PROCESSOR
1500
1504

FIG. 24

PHARMACEUTICAL DISPENSING SYSTEMS AND GRAPHICAL USER INTERFACES ASSOCIATED WITH SAME

RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. Provisional Patent Application Nos. 61/053,921, filed May 16, 2008, 61/053,735, filed May 16, 2008, 61/077,661, filed Jul. 2, 2008, and 61/105,529, filed Oct. 15, 2008, the disclosures of which are incorporated herein by reference as if set forth in their entireties.

RESERVATION OF COPYRIGHT

FIELD OF THE INVENTION

The present invention relates generally to the dispensing of prescriptions of pharmaceuticals and, more particularly, to methods, systems and computer program products for dispensing of pharmaceuticals.

BACKGROUND

Pharmacy generally began with the compounding of medicines, which entailed the actual mixing and preparing of medications. Heretofore, pharmacy has been, to a great extent, a profession of dispensing, that is, the pouring, counting, and labeling of a prescription, and subsequently transferring the dispensed medication to the patient. Because of the repetitiveness of many of the pharmacist's tasks, automation of these tasks has been desirable. Various attempts have been made to automate the pharmacy environment. Different exemplary approaches are shown in U.S. Pat. No. 5,337,919 to Spaulding et al. and U.S. Pat. Nos. 6,006,946; 6,036,812 and 6,1767392 to Williams et al. As automated pharmacy machines have become substantially more robust and complex, operating software that is correspondingly robust is needed to facilitate user interaction and control of these machines.

SUMMARY

In view of the above discussion, a pharmaceutical dispensing system includes a frame having first and second opposed sides, a plurality of cells configured to house pharmaceutical pills, each of the cells being accessible from the first side of the frame for replenishment of pharmaceutical pills therein, and a plurality of chutes, each of the chutes connected to and associated with a respective one of the plurality of cells, each of the chutes being accessible from the second side of the frame for dispensing of pharmaceutical pills. The pharmaceutical dispensing system includes a first touch screen display on the frame first side, and a second touch screen display on the frame second side.

The pharmaceutical dispensing system includes a processor and memory coupled thereto. A computer program resides in the memory that is executable by the processor for displaying a cell inventory graphical user interface (GUI) within the first touch screen display. The cell inventory GUI displays cell inventory information, and includes one or more GUI controls that are responsive to user touching for adding and/or modifying contents of the cells. Also, a computer program resides in the memory that is executable by the processor for displaying a prescription processing GUI within the second touch screen display. The prescription processing GUI comprises status information about a prescription order at a respective stage of completion of the prescription order by the pharmaceutical dispensing system.

The cell inventory GUI displays a graphical representation of each cell. In some embodiments, the graphical representation of each cell is displayed in a color that indicates an inventory level of pharmaceutical pills therein.

The prescription processing GUI displays an array of chute icons. Each chute icon corresponds to a respective chute and displays information about prescription orders for the corresponding chute. For example, each chute icon displays the number of prescription orders in a queue for a corresponding chute, and the number of pills within a prescription order for a respective chute. Each chute icon also displays indicia that indicates when a prescription order is ready in a corresponding chute, and indicia that indicates when a prescription order for a corresponding chute is incomplete. Each of the chute icons is responsive to user touching and, when touched by a user, displays a record for each prescription order in a queue for the corresponding chute. The displayed record includes status information for a respective prescription order, such as prescription order number, drug name, number of pills, prescription processing status, etc. In some embodiments, each prescription order record is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a respective prescription order.

In some embodiments, a border of each chute icon is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a prescription order for a corresponding chute. In some embodiments, each chute icon is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a corresponding chute. In some embodiments, each chute icon expands to an enlarged display size in response to user touching.

In some embodiments, a computer program resides in the memory and is executable by the processor for displaying a report builder GUI within the first and second touch screen displays. The report builder GUI is configured to build reports relating to one or more of the following: pending prescription orders, filled prescription orders, cell inventory information, and drug information.

In some embodiments, a computer program resides in the memory and is executable by the processor for monitoring selected functions of the pharmaceutical dispensing system and for storing selected parameters associated with the monitored functions.

According to some embodiments of the present invention, a GUI for display within a touch screen display of a pharmaceutical dispensing system is configured to display status information about a prescription order at a respective stage of completion of the prescription order by the pharmaceutical dispensing system. The pharmaceutical dispensing system is configured to receive a prescription order and fill a chute with pills according to the prescription order. The GUI includes first and second adjacent portions. An array of chute icons is displayed within the first portion. Each chute icon displays information about prescription orders associated with a corresponding chute and is responsive to user touching. A record for each prescription order in a queue for a corresponding chute is displayed in the GUI second portion in response to user touching a respective chute icon. Each displayed record

includes status information for a respective prescription order, such as prescription order number, drug name, number of pills, prescription processing status, etc. In some embodiments, each prescription order record is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a respective prescription order.

In some embodiments, a border of each chute icon is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a prescription order for a corresponding chute. In some embodiments, each chute icon is displayed with a graphic effect (e.g., color, shading, etc.) that indicates the status of a corresponding chute. In some embodiments, each chute icon expands to an enlarged display size in response to user touching.

According to some embodiments of the present invention, a GUI for display within a touch screen display of a pharmaceutical dispensing system is configured to display pharmaceutical pill inventory information. The pharmaceutical dispensing system includes a plurality of cells, and each cell is configured to contain a predetermined number of respective pharmaceutical pills. The GUI displays pharmaceutical pill inventory information for each cell, and at least one GUI control responsive to user touching for adding and/or modifying contents of each of the cells in some embodiments, the pharmaceutical pill inventory information for each cell is displayed in a color that indicates an inventory level of pharmaceutical pills therein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a flow chart depicting operations of a pharmaceutical dispensing system according to embodiments of the present invention.

FIG. **2** is a perspective view of the replenishing side (illustrating the cells) of a pharmaceutical dispensing system according to embodiments of the present invention.

FIG. **3** is a reverse perspective view of the dispensing side (illustrating the chutes) of the pharmaceutical dispensing system of FIGS. **2-3**.

FIG. **4** is a section view of an exemplary cell of the system of FIGS. **2-3**.

FIG. **5** is a flowchart illustrating the replenishing of cells of the system of FIGS. **2-3**.

FIG. **6** is a side view of an exemplary chute of the system of FIGS. **2-3** in which pills from a cell are being staged.

FIG. **7** is a side view of the chute of FIG. **6** illustrating staged pills being dispensed into a pill container.

FIG. **8** is a flow chart illustrating the dispensing of pills from chutes of the system of FIGS. **2-3**.

FIGS. **9-11**; **12**A-**12**B; **13-16**; **17**A-**17**E; **18**A-**18**C; **19**A-**19**F; and **20**A-**20**C are graphical user interfaces (GUIs) that allow an operator of the pharmaceutical dispensing system of FIGS. **2-3** to perform various functions, in accordance with various embodiments of the present invention.

FIGS. **21**A-**21**G are GUIs that allow an operator of the pharmaceutical dispensing system of FIGS. **2-3** to build, view, print and export various reports, in accordance with some embodiments of the present invention.

FIGS. **22-23** are flow charts illustrating operations of a Device Relationship Management (DRM) component for the pharmaceutical dispensing system of FIGS. **2-3**, in accordance with some embodiments of the present invention.

FIG. **24** is a block diagram that illustrates a software architecture for implementing operations of the pharmaceutical dispensing system of FIGS. **2-3**, in accordance with some embodiments of the present invention.

DETAILED DESCRIPTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which illustrated embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless expressly stated otherwise. It will be further understood that the terms "includes," "comprises," "including," and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements may be present. Furthermore, "connected" or "coupled" as used herein may include wirelessly connected or coupled. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

It will also be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first GUI control could be termed a second GUI control, and, similarly, a second GUI control could be termed a first GUI control without departing from the teachings of the disclosure.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

The term "container", as used herein, refers to any type of container including pill containers or vials used to fill a prescription, as well as "stock" bottles that contain pills used to refill cells on the replenishing side of a pharmaceutical dispensing system.

The term "pills" refers to any type of medicament that can be counted and dispensed by a pharmaceutical dispensing system including, but not limited to, capsules, tablets, caplets, gel caps, lozenges, and the like.

The term "wizard", as used herein, refers to a computer utility designed to simplify the execution of lengthy or complicated tasks. As known to those of skill in the art, a wizard is essentially a programmatic method of providing guidance to an operator via GUIs.

The present invention may be embodied as systems, methods, and/or computer program products for carrying out various operations of a pharmaceutical dispensing system. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident soft-

ware, micro-code, etc.). Furthermore, the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The computer-usable or computer-readable medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device. More specific examples (a non-exhaustive list) of the computer-readable medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), and a portable compact disc read-only memory (CD-ROM).

The present invention is described herein with reference to graphical user interfaces (GUIs), flowchart illustrations and block diagram illustrations of methods, systems, and computer program products for implementing the various operations of a pharmaceutical dispensing system, according to embodiments of the present invention. It will be understood that each block of the flowchart and/or block diagram illustrations, and combinations of blocks in the flowchart and/or block diagram illustrations, may be implemented by computer program instructions and/or hardware operations. These computer program instructions are provided to a processor, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor and create means for implementing the functions specified in the GUIs, flowcharts and block diagram blocks.

These computer program instructions may also be stored in a computer usable or computer-readable memory such that the instructions produce an article of manufacture including instructions that implement the functions specified in the GUIl, flowcharts and block diagram blocks.

The computer program instructions may also be loaded onto a controller or other programmable data processing apparatus to cause a series of operational steps to be performed on the controller or other programmable apparatus to produce a computer implemented process such that the instructions that execute on the controller or other programmable apparatus provide steps for implementing the functions specified in the GUIs, flowcharts, and block diagram blocks.

Referring to FIG. **1**, an exemplary process of a pharmaceutical dispensing system **40**, according to embodiments of the present invention, is described generally. The process begins with the entry of prescription data (Block **20**). The correct number of pills to fill the prescription is dispensed from a cell containing a bulk supply of those pills into an attached chute (Block **22**). The pills are then dispensed from the chute into a vial (hereinafter referred to as a pill container) (Block **24**), wherein the pill container is typically held by pharmacy personnel. Optionally, the process may include a step in which a door of the chute is unlocked, typically in response to the system providing authorization to an operator to release the pills from the chute (Block **23**).

A system that can carry out this process is illustrated in FIGS. **2** and **3** and designated broadly therein at **40**. The system **40** includes a support frame **44** for the mounting of its various components. The system **40** generally includes as operative stations a controller (represented in FIGS. **2** and **3** by two monitors **42**, **43**), a number of tablet dispensing cells **100**, and a number of chute assemblies **102**, each associated with a respective cell **100**. As can be seen in FIGS. **2** and **3**, the cells **100** are mounted on one side **45***a* of the frame **44**, and the chute assemblies **102** are mounted on the opposite side **45***b* of the frame **44**.

In the illustrated embodiment, the cells **100** are configured to singulate, count and dispense pills through an air agitation technique. The air agitation technique is described in some detail in, for example, U.S. Pat. No. 6,971,541 to Williams et al., supra, and U.S. Pat. No. 7,344,049, and need not be described in detail herein. Those skilled in this art will appreciate that other pill dispensing apparatus, including those that rely on mechanical singulating action (see, e.g., U.S. Pat. No. 7,014,063), may also be employed.

Referring now to FIG. **4**, the cells **100** are oriented so that each can be replenished by an operator facing the side **45***a* of the frame **44**. Each cell **100** includes a door **104** that is pivotally attached to the cell **100** at a hinge **106**. During dispensing of pills from the cell **100**, the door **104** is in a closed position. If the cell **100** requires replenishment, the door **104** can be moved to an open position that enables an operator to refill the cell **100** with the correct pills.

In some embodiments, each of the cells **100** may have a locking system (such as that illustrated and described in U.S. patent application Ser. No. 11/760,016, filed Jun. 8, 2007, the disclosure of which is hereby incorporated herein in its entirety) that prevents the door **104** from being opened without the scanning of an operator's ID badge or the receipt of replenishment authorization in another form. Each cell **100** may also have a bar code or other identifier (not shown) that indicates the contents of the cell **100**. Each of the cells **100** may also have a status light or other indicator (not shown) that indicates a particular cell **100** that is to be replenished in order to direct the operator to the proper cell **100**.

Referring now to FIGS. **6** and **7**, the chute assemblies **102** extend from the cells **100** on the side **45***a* to the side **45***b*, where pills dispensed from a cell **100** into a chute assembly **102** can be dispensed from the chute assembly **102** into a pill container. Each of the chute assemblies **102** includes a door **103**, gate or other selective access device at its lower end to allow dispensed pills to be "staged" in the chute assembly **102** after dispensing from the cell **100**; subsequently, an operator can open the door **103** to release the pills from the chute assembly **102** into a pill container positioned beneath the door **103** (FIG. **7**). Exemplary selective access devices are disclosed in, for example, U.S. Provisional Patent Application No. 60/955,056, filed Aug. 10, 2007; U.S. Provisional Patent Application No. 60/955,059, filed Aug. 10, 2007; U.S. patent application Ser. No. 12/185,981, filed Aug. 5, 2008; U.S. patent application Ser. No. 12/186,025, filed Aug. 5, 2008; U.S. patent application Ser. No. 12/187,666, filed Aug. 7, 2008, entitled SYSTEM AND METHOD FOR DISPENSING OBJECTS; U.S. patent application Ser. No. 12/187,574, filed Aug. 7, 2008, entitled DEVICE FOR STAGING AND DISPENSING TABLETS USEFUL IN SYSTEM AND METHOD FOR DISPENSING PRESCRIPTIONS; and U.S. patent application Ser. No. 12/191,571, filed Aug. 14, 2008, entitled SYSTEM AND METHOD FOR DISPENSING PRESCRIPTIONS, the disclosures of each of which are hereby incorporated herein by reference.

In some embodiments, a bar code scanner or other identifying device may also be included on the side **45***b* of the frame **44**. The bar code scanner can be configured to scan any or all of (a) a bar code on a pill container to identify a specific prescription, (b) an ID badge or other identifier of an operator

to verify that the operator has authorization to receive pills from a chute assembly **102**, (c) a bar code on a chute assembly **102** to identify the type of pills that are dispensed into that chute assembly **102**, or any other item of interest. In some embodiments, the bar code scanner may be replaced with an RFID tag detector and/or, in the case of identifying an authorized operator, a biometric scanner.

In some embodiments, the chute assemblies **102** may include a locking unit (not shown) that prevents the door from being opened without authorization (via a scan of an ID badge, and RFID tag, a biometric identifier, or the like) or without confirmation that it is the correct prescription (via a scan of the bar code on the pill container, for example). An exemplary locking unit is shown in U.S. Provisional Patent Application No. 60/955,056, supra. Also, in some embodiments, the chute assemblies **102** may include a light (not shown) or other indicator (not shown) that indicates which chute assembly **102** contains a given prescription.

According to some embodiments of the present invention, monitors **42** and **43** are touch screen monitors that display graphical user interfaces (GUIs) that allow operators to perform various functions. For example, an operator interacts with graphical representations (e.g., application icons) and controls (e.g., buttons, scroll bars, etc.) collectively referred to herein as GUI controls. These GUI controls perform various functions in response to physical touching by an operator (e.g., touching or tapping via a finger or stylus). GUIs displayed on each side of the pharmaceutical dispensing system **40** relate to tasks that can be performed on the respective sides of the pharmaceutical dispensing system **40**. For example, an operator monitors and controls the filling of prescriptions by interacting with GUI controls displayed via the dispensing side monitor **43**. An operator performs cell replenishment operations by interacting with GUI controls displayed via the replenishing side monitor **42**.

An operator monitors the pharmaceutical dispensing system **40** and interacts with it when initiating certain functions and procedures, e.g., replenishing a cell **100**, processing a prescription, etc. According to some embodiments of the present invention, the various GUIs share a common set of functional GUI controls. Moreover, all GUI windows and screens are labeled and employ a consistent "look and feel." In addition, GUI controls related to routine prescription queue management activities are color-keyed and informative. Some GUI controls appear on all toolbars and wizards displayed within the various GUIs. Other GUI controls are context-sensitive.

Instead of employing physical input devices, such as a keyboard, numeric keypad, or mouse, the various GUIs display a virtual keyboard/keypad when one is needed. The operator's finger, in effect, replaces the mouse. According to embodiments of the present invention, the virtual keyboard displayed in various ones of the GUIs includes a filtering function, as will be described below.

The monitor **43**, which is located on the dispensing side **45***b* of the frame **44**, displays GUIs which are used to control operations pertaining to dispensing, including the establishment of authorization to dispense pills into a pill container, the locking/unlocking of the doors **103** to chute assemblies **102**, the indication of the proper chute assembly **102** for a particular prescription, and the like. The monitor **43** also displays GUIs which are used to control the dispensing of pills from the cells **100** into the chute assemblies **102**, either automatically or manually. Dispensing can be the result of manual entry by an operator via one or more GUIs displayed in monitor **43**, or can be directed by an external computer, such as an overall pharmacy host computer. The replenishing side monitor **42** displays GUIs which are used to control operations pertaining to replenishment of cells **100**, including the need for replenishment, the locking/unlocking of cells **100**, the indication of the proper cell **100**, confirmation that the correct pills are being added to a cell **100**, rejection of incorrect pills, and the like.

The side **45***a* of the system **40** illustrated in FIG. **2** is referred to as the "inventory side" or "replenishing side." The replenishing side of the system **40** includes an array of cells **100**, each of which is configured to store pills of a respective drug. The replenishing side of the system **40** may also include a barcode scanner (not illustrated) for scanning barcodes associated with cells **100** and containers. The system **40** dispenses pills from a cell **100** to fill a particular prescription. GUIs displayed via the monitor **42** on the replenishing side are configured to display various types of information to an operator regarding the status of pill inventory in the various cells **100**. In addition, various operator tasks may be performed via GUIs displayed via the replenishing side monitor **42** including, but not limited to, operations associated with replenishing cells **100** with pills, adding a new drug to inventory, setting up parameters of a cell **100**, modifying parameters of cells **100**, and performing return-to-stock (RTS) operations.

The side **45***b* of the system **40** illustrated in FIG. **3** is referred to as the "prescription side" or the "dispensing side." The monitor **43** on the dispensing side displays, via various GUIs, information to an operator regarding the status of prescription filling operations (e.g., pending, complete, incomplete, etc.). If a prescription filling operation cannot be completed for some reason, a GUI displays relevant information regarding this via monitor **43**. In addition, various operator tasks may be performed via GUIs displayed via the dispensing side monitor **43** including, but not limited to, prescription order monitoring/processing, performing manual prescription filling, scanning out completed prescriptions, resubmitting exceptions, and performing system operations (e.g., configuring cells **100**, running diagnostics, etc.).

Dispensing Side GUIs

Prescription processing is monitored and managed from the dispensing side **45***b* of the system **40**. An operator monitors and controls the filling of prescription orders by touching various GUI controls in the GUIs displayed on the dispensing side monitor **43**. Dispensing side tasks include prescription order monitoring/processing, performing manual prescription fills, scanning out completed prescriptions, resubmitting exceptions, and performing routine system operations (e.g., configuring cells **100**, running diagnostics, etc.).

A Home GUI **400**, illustrated in FIG. **9**, is utilized for prescription monitoring and prescription queue management activities. The illustrated Home GUI **400** has an upper section **410** and a lower section **420**. The upper section **410** displays the Chute Details window **412**, which identifies the prescription order(s) currently in each chute's queue, the status of each prescription order (e.g., Ready, Hold, Pending or Incomplete), drug name and chute/cell ID, prescription number and pill quantity. A record for each prescription order for a respective chute **102** is displayed within the Chute Details window **412**. In some embodiments, the color of each displayed prescription record in the Chute Details window **412** communicates the status (pending, complete, on hold, etc.) of the prescription order. For example, green may indicate a prescription order is ready, light blue may indicate a prescription order is currently being filled, white may indicate that a prescription order is pending or on hold, and red may indicate

that a prescription order is incomplete. For example, in the illustrated embodiment, prescription order record **414***a* may be displayed in green to indicate that the prescription order associated with prescription order record **414***a* is ready (i.e., that a chute **102** contains pills that are ready to be dispensed into a pill container pursuant to a prescription order). Embodiments of the present invention, however, are not limited to any particular colors for indicating prescription order status. Various colors, as well as shadings and other graphic effects, may be utilized, without limitation.

The lower section **420** of the illustrated Home GUI **400** displays the Main Chute Grid **422**, which provides information about each chute **102**, including a chute's status and current pill quantity. The Main Chute Grid **422** includes an array of chute icons **424**, each chute icon **424** corresponding to a particular chute **102** of the pharmaceutical dispensing system **40**. The displayed array of chute icons **424** corresponds to the physical array of actual chutes **102** of the pharmaceutical dispensing system **40**. In other words, the chute icons **424** are arranged in the same number of rows and columns as the actual chutes **102** in order to facilitate easy location of a chute **102** by an operator.

Each chute icon **424** in the Main Chute Grid **422** is responsive to user touching for displaying information about a particular chute **102**. When a chute icon **424** is touched, its displayed size is expanded within the Main Chute Grid **422** to display additional information, as illustrated in FIG. **10**. When a chute icon **424** is in an expanded display, a graphic effect (e.g., color, shading, glow, blur, etc.) of the border indicates the status of a prescription order for the chute **102**. In addition, the expanded chute icon **424** displays the number of pills contained within the chute **102**, and the number of prescription orders in the queue for the particular chute **102**. Touching any of the chute icons **424** for active chutes **102** also displays, within the Chute Details window **412**, a prescription order record for each prescription order for the corresponding chute **102**.

Referring back to FIG. **9**, the Home GUI **400** has an upper main toolbar **430** and a lower main toolbar **440**. GUI controls included in the upper main toolbar **430** include Manual Fill GUI control **430***a*, System Functions GUI control **430***b* and Home GUI control **430***c*. Manual Fill GUI control **430***a*, when touched by an operator, allows the operator to enter a prescription order into the pharmaceutical dispensing system **40** manually (rather than it being sent to the system **40** automatically, such as from a pharmacy host system). Upon activating GUI control **430***a*, a manual fill wizard is launched that guides an operator through a process for manually filling a prescription order. System Functions GUI control **430***b* allows an operator to display and/or configure various parameters of the pharmaceutical dispensing system **40**. Home GUI control **430***c*, when touched by an operator, displays the Home GUI **400**.

GUI controls included in the lower main toolbar **440** include Run GUI control **440***a*, Pause GUI control **440***b*, and Open Message Queue GUI control **440***c*. An operator touches the Run GUI control **440***a* to process and fill prescription orders. In "Run" mode, pending prescription orders are filled (e.g., chutes **102** are filled with pills from respective cells **100** pursuant to a prescription order). An operator touches the Pause GUI control **440***b* to suspend prescription order processing. In "Pause" mode, prescription orders can be submitted to the pharmaceutical dispensing apparatus **40**, but are not filled until the Run GUI control **440***a* is touched. The Open Message Queue GUI control **440***c*, when touched by an operator, opens the alert message queue. Open Message Queue GUI control **440***c* is displayed automatically when there is a message. The alert message queue contains messages generated by the pharmaceutical dispensing system **40**, for example, error messages that relate to system-level problems such as with filling prescriptions, etc. Touching the Open Message Queue GUI control **440***c* displays a list of the most recent alert messages (e.g., up to five, etc.) issued by the pharmaceutical dispensing apparatus **40**.

The illustrated Home GUI **400** also has a taskbar **450** that contains context-sensitive GUI controls **450***a*-**450***f*. These GUI controls **450***a*-**450***f* are enabled only when their functions can be performed on a currently selected prescription order record in the Chute Details window **412**. Delete GUI control **450***a* deletes a selected prescription order. For example, to delete or cancel a pending prescription order from the pending queue, an operator selects a pending prescription order record in the Chute Details window **412** and then touches GUI control **450***a* to delete the prescription order.

Retry GUI control **450***b* resubmits a prescription order. This is used mainly to retry running/waiting prescription orders that are incomplete for some reason (e.g., a cell **100** is out of pills, etc.), or because some error occurred in the pharmaceutical dispensing system **40**. In operation, a prescription order record displayed in the Chute Details window **412** is selected. The operator then touches GUI control **450***b* to resubmit the selected prescription order for processing.

Details GUI control **450***c* displays detail information about incomplete (and complete) prescription orders. For example, when a prescription order record displayed within Chute Details window **412** is selected, an operator then touches GUI control **450***c* to display information about the selected prescription order. Advance GUI control **450***d* moves a prescription order to the top of the queue for a particular chute **102**. For example, when a prescription order record displayed within Chute Details window **412** is selected, an operator can touch GUI control **450***d* to advance the selected prescription order to the top of the displayed queue.

The Chute Details window **412** only displays a certain number of prescription order records at a time. The Next/Last GUI controls **450***e*, **450***f* allow an operator to move forward and backward, respectively, through multiple pages of displayed records.

FIG. **10** illustrates the Home GUI **400** wherein an operator has touched a chute icon **424** for a particular chute **102**. The chute icon **424** has expanded its display size within the Main Chute Grid **422**, as illustrated. The expanded chute icon **424** corresponds to a chute with the ID of "**1**C" and indicates that nine (9) pills are in chute **1**C, and that there are two (2) prescriptions in the queue for chute **1**C. An enlarged view of the expanded chute icon **424** is illustrated in FIG. **11**. The border **425** has a color (or other graphic effect, such as shading, etc.) that indicates the status of a prescription order for chute **1**C (e.g., red for incomplete prescription orders, green for complete prescription orders, etc.).

Referring back to FIG. **9**, in some embodiments, chute icons **424** displayed within the Main Chute Grid **422** are displayed in colors (or other graphic effects, such as shading, etc.) to indicate the status of corresponding chutes **102**. For example, non-configured chutes **102** (i.e., chutes that are not being used to fill prescription orders) may have corresponding chute icons **424** that are black. Active chutes **102** are chutes that are currently being used to fill prescription orders, and may have corresponding chute icons **424** that are white. Inactive chutes **102** are chutes that are configured to be used to fill prescription orders, but that are not currently being used to fill prescription orders. Inactive chutes **110** may have corresponding chute icons **424** that are grey. Accordingly, an

operator can quickly and accurately learn the status of all chutes **102** of the pharmaceutical dispensing system **40** by viewing the Main Chute Grid **422** in Home GUI **400**.

Chute icons **424** within the Main Chute Grid **422** may also include a "check mark" or an "X mark" (FIGS. **12**A-**12**B). Checkmarks and X marks may be color-coded (e.g., checkmarks may be green and X marks may be red, etc.). A checkmark means the chute **102** represented by the chute icon **424** contains a prescription order that is ready. An X mark means that the chute **102** represented by the chute icon **424** contains an incomplete prescription order. For example, as illustrated in FIG. **12**A, chute "**1**C" contains a prescription order that is ready. As illustrated in FIG. **12**B, chute "**1**M" contains an incomplete prescription order.

When an operator touches a prescription order record in the Chute Details window **412**, context-sensitive GUI controls **450***a*-**450***f* in the taskbar **450** are activated. For example, if a selected prescription order record is for an incomplete prescription order, the Retry GUI control **450***b* is activated so that the operator has the option to rerun the prescription order. The Details GUI control **450***c* is also activated so that the operator can display additional information to help remedy an error condition that caused the incomplete prescription order.

As a prescription order is processed and filled by the pharmaceutical dispensing system **40**, its status is displayed in the Status column of the Chute Details window **412**. A "pending" status is assigned to all prescription orders when first received from a pharmacy's computer. A "hold" status is assigned to all prescription orders received from a pharmacy's computer when the "On Demand" option is enabled. "On Demand" is a function of the pharmaceutical dispensing system **40** that allows individual prescription orders to be expedited and filled. When "On Demand" is enabled, all prescription orders received from a pharmacy's computer initially are assigned a processing status of "hold." Once the corresponding prescription order record is selected for a prescription order with a "hold" status, the prescription order can be moved to the top of the queue for a chute **102** by using the Advance GUI control **450***d*. If "On Demand" is disabled, prescription orders received from a pharmacy's computer are assigned a state of "pending" and are processed automatically on a "first in, first out" basis.

A "waiting" status indicates that a prescription order is at the top of the queue for a particular chute **102** and the pharmaceutical dispensing system **40** is preparing to process the prescription order. A "counting" status indicates that the pills for a prescription order are being counted and currently being dispensed into a chute **102**. A "ready" status indicates that pill counting is complete and the pills are in the chute **102**, ready to be dispensed into a pill container by the operator. A prescription order has a "complete" status when the pills for the prescription order have been cleared from a chute **102** (i.e., an operator has dispensed the pills from a chute **102** into a pill container). In some embodiments of the present invention, the word "complete" does not actually appear in the status column of the Chute Details window **412**. Completed orders can be tracked using the Reports component of the pharmaceutical dispensing system **40**, as described below. An "incomplete" status indicates that a prescription order was not filled successfully by the pharmaceutical dispensing system **40**.

Various other functions can be performed via the Chute Details window **412**. For example, an operator can locate and unlock a chute **102** for a particular prescription order. Details regarding an incomplete prescription order (e.g., insufficient pill quantity, etc.) can be displayed via the Details GUI control **450***c*. An incomplete prescription order can be rerun by the pharmaceutical dispensing system **40** via the Retry GUI control **450***b*. A prescription order can be cancelled by removing the corresponding prescription order record from the Chute Details window **412** via the Delete GUI control **450***a*.

Replenishing Side GUIs

Referring now to FIG. **13**, a Cell Inventory GUI **500** is illustrated. The Cell Inventory GUI **500** is considered the "Home GUI" for the replenishing side of the pharmaceutical dispensing system **40**. The Cell Inventory GUI **500** displays information about the contents of cells **100** on the replenishing side **45***a* of the pharmaceutical dispensing system **40** that are currently calibrated to contain a particular drug. For example, the Cell Inventory GUI **500** displays the following information about each cell **100**: cell location, drug contained within cell, NDC (National Drug Code) information, and drug quantity in each cell. As known to those skilled in the art, drug products are identified and reported using a unique, three-segment NDC number, which is a universal product identifier for human drugs.

The illustrated Cell Inventory GUI **500** has an upper main toolbar **502** and a lower main toolbar **504**. GUI controls in the upper main toolbar **502** include Delete Cell GUI control **502***a*, New Drug GUI control **502***b*, New Cell GUI control **502***c*, Systems Functions GUI control **430***b*, and Home GUI control **502***d*. Systems Functions GUI control **430***b* is the same GUI control as described above with respect to the Home GUI **400** (FIG. **9**) for the Dispensing side of the pharmaceutical dispensing system **40**. The Delete Cell GUI control **502***a* allows an operator to delete a cell **100** from a database of the pharmaceutical dispensing system **40**.

The Cell Inventory GUI **500** serves as the launching point for various wizards, including a Replenish wizard, an RTS wizard, a New Cell wizard, and a New Drug wizard, etc. The wizard GUI controls appear in the upper main toolbar **502**. For example, the New Drug GUI control **502***b* launches a New Drug wizard that is used by an operator when adding a new drug to the inventory of the pharmaceutical dispensing system **40**, as will be described below. The New Cell GUI control **502***c* launches a New Cell wizard that is used by an operator when setting up a new cell **100**, as will be described below. The Home GUI control **502***d* displays the Cell Inventory GUI **500**.

GUI controls in the lower main toolbar **504** include a Filter GUI control **504***a* and Next/Last GUI controls **450***e*, **450***f*. Filter GUI control **504***a* allows an operator to filter displayed information via a filter keyboard **700** (FIG. **16**). The Filter GUI control **504***a* allows an operator to quickly display information that matches a filtering key selected from the filter keyboard **700**. For example, using the filtering keypad **700**, an operator can find specific information (e.g., a drug name, patient surname, etc.) with the fewest number of keystrokes needed to identify and display the information. For example, if an operator wanted to display all drug names beginning with the letter "C", the operator would touch the letter "C" on the filter keypad **700**. In some instances, filtering may be performed automatically. For example, when an operator initiates an RTS procedure by scanning a pill container, the information in the Cell Inventory GUI **500** (FIG. **13**) is automatically filtered. In other words, the Cell Inventory GUI **500** displays only the record for the cell that dispensed the prescription order. Next/Last GUI controls **450***e*, **450***f* allow an operator to move forward and backward, respectively, through multiple pages of displayed information.

The Cell Inventory GUI **500** displays cell inventory information in read-only mode. The displayed information can be

filtered and/or sorted. For example, only cells containing a certain drug can be displayed, etc.

In the Cell Inventory GUI **500**, cells that are either empty or contain pills below a "low Inventory" level (e.g., less than 50 pills, etc.) are shaded, for example in yellow, so that they are brought to the attention of the operator. Each cell **100** of the pharmaceutical dispensing system **40** includes a status indicator, such as light emitting diode (LED). Touching any row displayed in the Cell Inventory GUI **500** causes a status indicator for the corresponding cell **100** to flash for a predetermined duration, for example 15 seconds. The status indicator allows the operator to quickly locate the cell **100** on the replenishing side of the system **40**. Scanning a pill container or stock bottle on the replenishing side of the pharmaceutical dispensing system **40** displays the location of the cell containing the corresponding drug.

Referring to FIG. **14**, a Parameters GUI **600** is illustrated that displays information about a particular cell **100** and a drug contained within the cell **100**. The Parameters GUI **600** is configured to display a Drug Parameters GUI **610** and a Cell Parameters GUI **620** (FIG. **15**). Drug Parameters GUI **610** is displayed by an operator touching Drug Parameters tab **610***a*, and the Cell Parameters GUI **620** is displayed by an operator touching the Cell Parameters GUI **620***a*. An operator can add/modify certain drug and cell settings and values (e.g., air pressure, and other dispensing values) via these two GUIs.

The Parameters GUI **600** includes an upper main toolbar **602**. GUI controls in the upper main toolbar **602** include Print GUI control **602***a*, Delete Cell GUI control **602***b*, Return to Stock (RTS) GUI control **602***c*, Replenish Cell GUI control **602***d*, Systems Functions GUI control **430***b*, and Home GUI control **502***d*. The Print GUI control **602***a* allows an operator to print labels for cells **100**. The Delete Cell GUI control **602***b* allows an operator to delete a cell (i.e., the particular cell **100** for which the Parameters GUI **600** is currently displayed) from a cell database of the pharmaceutical dispensing system **40**. The RTS GUI control **602***c* launches an RTS wizard which allows an operator to return dispensed pills to a cell **100**. The Replenish Cell GUI control **602***d* launches a Replenish Cell wizard that allows an operator to restock the pill inventory of a cell **100**. The Home GUI control **502***d* displays the Cell Inventory GUI **500**. The Systems Function GUI control **430***b* is the same GUI control as described above with respect to the Home GUI **100** (FIG. **9**) of the Dispensing side of the pharmaceutical dispensing system **40**.

The Parameters GUI **600** is accessed by scanning a cell (i.e., scanning a barcode attached to a cell **100** via a barcode scanner associated with the Replenishing side of the pharmaceutical dispensing system **40**). The Parameters GUI **600** displays the current settings for the scanned cell and for the drug the cell is configured to dispense. For example, in the illustrated Drug Parameters GUI **610** displayed in FIG. **14**, parameter information displayed about the drug within a specific cell **100** includes drug name, NDC, lot number, lot expiration, manufacturer, and various other information. Some of these parameters can be modified by an operator via an Edit GUI control **604**. In the illustrated Cell Parameters GUI **620** (FIG. **15**), parameter information displayed about the cell includes type of cell, capacity, low inventory level, and various other information. Some of these parameters can be modified by an operator via an Edit GUI control **604**.

Replenish Wizard

There are several occasions when an operator needs to add drugs to one or more of the cells **100**. For example, a cell **100** that is empty or whose pill inventory is low needs to be replenished. In addition, when a new drug is added to the pharmaceutical dispensing system **40** one or more cells **100** need to be replenished. Cell replenishment is performed from the replenishing side of the pharmaceutical dispensing system **40**. Drug replenishment can occur at any time, including when the pharmaceutical dispensing system **40** is in run mode and processing prescription orders.

The Replenish wizard **800** is illustrated in FIGS. **17**A-**17**E and is launched via Replenish Cell GUI control **602***d*. The various steps of replenishing a cell **100** are numbered on the left hand side of the various replenish wizard GUIs, as illustrated (FIGS. **17**A-**17**E). To replenish a cell **1001** the following steps are performed. The stock bottle of the drug to be replenished is retrieved and the cell to be replenished is located. On the Cell Inventory GUI **500**, an operator touches the Replenish Wizard GUI control **602***d*. The replenish wizard appears and the operator is directed to scan the NDC barcode on the stock bottle to verify that the correct drug is being added to a cell **100** via a barcode scanner associated with the pharmaceutical dispensing system **40**. Alternatively, a pop-up keyboard may be used to enter the NDC number manually. The operator then enters the lot number on the stock bottle using the pop-up keypad. The operator then touches the stock bottle expiration GUI control and selects the month/year from the month/year drop-down list. The operator then touches the add GUI control and enters the number of pills to be added to the cell **100** using the pop-up keypad. The operator then adds pills to the cell **100**, closes the cell door and touches the complete GUI control.

Return-to-Stock Wizard

Referring now to FIGS. **18**A-**18**C, the return-to-stock (RTS) wizard **900** will now be described. The RTS procedure is used to return partial prescription fills, calibration fills, and unclaimed prescription orders to the system **40**. RTS procedures are performed on the replenishing side of the system **40**. To perform an RTS procedure, a barcode on the pill container containing pills to be returned to stock is scanned, for example via scanner **50**, and the RTS Wizard starts automatically. Alternatively, the user can open the RTS Wizard by touching the RTS Wizard GUI control **602***c* in the Parameters GUI **600**. The indicator light flashes on the cell **100** from which the prescription was filled to identify to the operator the correct cell **100** for the pills being returned. The operator then scans a barcode associated with the identified cell **100**. If the scan indicates that an operator is attempting to return pills to the wrong cell **100**, an error message is displayed. The pill quantity is automatically calculated and displayed. The displayed value is the quantity of pills that were dispensed for this prescription order. For example, if only 9 pills were dispensed for a prescription order requiring 10 pills, the displayed return quantity is 9. The operator then empties the contents of the container into the correct cell **100**. The operator then touches the complete GUI control to conclude operations.

New Cell Wizard

Referring now to FIGS. **19**A-**19**F, a New Cell wizard **1000** is illustrated that is used for setting up and calibrating a cell **100** to house a drug already specified in the Master Drug List (MDL). The MDL is an internally maintained database of the pharmaceutical dispensing system **40** that includes all the drug dispensing information for each drug in the system's

inventory. The New Cell wizard **1000** is launched via the New Cell GUI control **502***c* in the Cell Inventory GUI **500** (FIG. **13**).

To set up a new cell, an operator launches the New Cell wizard via New Cell GUI control **502***c*. The cell door of the new cell **100** is opened and the bar code associated with the cell **100** is scanned via a barcode scanner associated with the pharmaceutical dispensing system **40**. The bar code on the stock bottle is also scanned. Alternatively, the NDC of the drug can be entered manually via a pop-up keypad. The operator enters the Lot number of the drug, the Lot expiration date, and the pill quantity being added to the cell **100**. The pills are then added to the cell **100** and the cell door is closed.

New Drug Wizard

Referring now to FIGS. **20**A-**20**C, adding a new drug to the system **40** will be described. An operator uses the New drug wizard **1100** to add a new drug to the pharmaceutical dispensing system **40**. A new drug is one not currently described in the MDL of the pharmaceutical dispensing system **40**. Operations for adding a new drug to the pharmaceutical dispensing system **40** are performed on the replenishing side of the system **40**. A new drug can be added to inventory at any time including while the pharmaceutical dispensing system **40** is in run mode and processing prescription orders.

The various steps of adding a new drug are numbered on the left hand side of the various add drug wizard GUIs, as illustrated (FIGS. **20**A-**20**C). From the Cell Inventory GUI **500**, an operator touches the New Drug Wizard GUI control **502***b*. The operator then enters the drug name using the pop-up keyboard. The new drug wizard then directs the operator to scan the barcode on the stock bottle via a barcode scanner associated with the pharmaceutical dispensing system **40**, or to touch the NDC GUI control and enter the NDC manually using the pop-up keyboard. The operator then enters the thirty Dram capacity for the drug using the pop-up keypad (thirty dram capacity is required so that the system **40** can calculate how many pill containers are needed to fill any given prescription order based on the number of pills ordered).

Reports

The pharmaceutical dispensing system **40** includes a reports component, which allows an operator to build, run, export, and print reports. Exemplary reports are identified in Table 1 below. However, embodiments of the present invention are not limited to the identified reports.

TABLE 1

Report	Description
Audit Cell	Displays any changes to cell parameters by operator.
Audit Drug	Displays any changes to drug parameters by operator.
Cell Settings	Lists all active cells and their current calibration status and dispensing parameters (baffle, height, width, and pressure).
Dispense Info	Lists prescription orders filled by the pharmaceutical dispensing system during a designated date range.
Drug Prescription History	Lists all drugs dispensed by the pharmaceutical dispensing system during a designated interval.
Drug Setup	Displays all cells that were set up with a drug during a designated interval.
Inventory by Cell	Displays the inventory for each cell in the pharmaceutical dispensing system.
Inventory by Drug Code	Displays the pharmaceutical dispensing system's inventory by drug code.
Lot Usage	Lists all prescription orders and the Lot number used to fill each prescription order for a given drug code. If a Lot number is specified, this report lists only those orders filled with the given drug code and Lot number.
Low Cell	Lists all cells with inventory less than the drug's low inventory threshold.
Non-Calibrated Cells	Lists all active cells for which a calibration fill has not yet been successfully completed.
Operator Actions	Displays certain actions performed on the unit by a given operator during a specified time range.
Order Detail	Displays all details for a specific prescription order. These include the states the order passed through in the unit, dispensing cell information and dispensing shelf location.
Replenish Info	Lists all replenishments and Return to Stock procedures.
Replenishments by Day	On a bar graph, displays a replenishment count grouped by hour for a specified day.
Prescription Volume by Day	On a bar graph, displays a count of prescription orders submitted to the pharmaceutical dispensing system and prescriptions picked up from the pharmaceutical dispensing system, grouped by hour for a specified day.
Prescription Volume by Drug Code	Displays a summary of the number of dispensed pills and prescriptions, grouped by drug code and a time period (day/month/year).

Referring to FIGS. **21**A-**21**G, operations for building, running, viewing, exporting, and printing reports (e.g., any of the reports listed in Table 1), according to some embodiments of the present invention will be described. Although the output of each report is different, the steps that an operator takes to generate a report generally are the same. These steps, broadly speaking, are build the report, view the report, set up a printer and print the report. Each of these steps are described below.

Table 2 below contains a description of column headings that are utilized in various ones of the reports that can be built, according to some embodiments of the present invention.

However, embodiments of the present invention are not limited to the listed column headings. Other column headings may also be utilized in various embodiments of the present invention.

TABLE 2

Column Heading	Description
Drug Code	The drug's NDC or DIN.
Drug Name	The name of the drug.
Entry date	Date prescription order was processed by the pharmaceutical dispensing system.
Loc.	Cell location. The cell ID (for example, 2B).
Lot Exp.	Expiration date of the stock bottle's Lot.
NDC Barcode	Bar code on the stock bottle identifying the drug's NDC value. Bar codes displayed in this column can be scanned via scanner.
Order No.	The prescription order number.
Qty.	Number of pills dispensed to fill a specific prescription order.
Vial No.	The number of vials needed to contain all of the pills for a prescription order.
Total Qty	Total number of pills dispensed per prescription order.
Script Total	Total number of prescriptions for a given drug.
Date Filled	Date prescription order was filled.
Script Count	Number of prescriptions filled for a given drug code.
Avg Pills/Script	Average number of pills per prescription for a given drug code.
Total Fill Qty	Total number of pills dispensed for a given drug code.
Replenish Date	Date a given cell was replenished.
Orig Qty	Original inventory in a cell when it was replenished.
Add Qty	Pill inventory added to a cell when it was replenished.
New Qty	Resulting inventory after a cell was replenished (Orig Qty + Add Qty).
Max Cap	The maximum established capacity for a cell that was replenished.
% Repl	Of the available pill capacity in a cell, the percentage that was replenished.
Total Qty.	Total number of pills dispensed for a particular drug.
Total Scripts	Total number of prescriptions processed for a particular drug.

According to some embodiments of the present invention, an operator builds a report on the dispensing side of the pharmaceutical dispensing system **40** by activating the System Functions GUI control **430***b* in the Home GUI **400** and then activating a "launch" GUI control that is displayed. In response, a reports GUI **1200** is displayed as illustrated in FIG. **21**A. An operator may also build reports on the replenishing side of the automated pharmacy system **40** by activating a System Functions GUI (or similar GUI control) in any of the replenishing side GUIs described above.

In the illustrated embodiment, the reports GUI **1200** shown in FIG. **21**A includes three separate GUIs: Build Report **1210**, View Report **1220**, and Setup **1230**. Each of these GUIs is displayed when an operator touches a respective tab **1210***a*, **1220***a*, **1230***a*, as illustrated. The Build Report GUI **1210** has three separate elements: Select Report **1212**, Report Parameters **1214**, and Apply Sorting **1216**. The Select Report element **1212** displays a list of reports that an operator can select. To build a report, an operator selects a report from this list, as illustrated in FIG. **21**B. In FIG. **21**B, the operator has selected the "Dispense Info" report.

After selecting a report, the report parameters, such as begin date and end date, are defined in the Report Parameters element **1214**, as illustrated in FIG. **21**C. Not all reports have selectable parameters, however. In the illustrated report, an operator is selecting a date range for the "Dispense Info" report. The "Dispense Info" report will display all of the prescription orders filled by the pharmaceutical dispensing system **40** during the specified time period. As illustrated in FIG. **21**D, a pop-up calendar can be displayed for use in selecting begin dates and end dates.

Referring to FIG. **21**E, the Apply Sorting element **1216** may be utilized to sort the output of various columns of a selected report (e.g., ascending order, descending order, etc.). In the illustrated Apply Sorting element **1216** displayed in FIG. **21**E, the operator has decided to sort by drug name in ascending order, and to sort by drug lot number in ascending order. The Reporting GUI displayed in FIG. **21**E also includes a Reset GUI control **1218** that allows an operator to start over and reenter desired sorting and report parameter criteria. When sorting with multiple columns, as illustrated in FIG. **21**E, sorting is performed from left to right, according to some embodiments of the present invention. For example, if an operator selects "Entry Date" in the first column of FIG. **21**E, and selects "Drug Code" in the second column of FIG. **21**E, a report will be sorted such that drug codes for each entry date will be displayed. Further, if an operator selects "Lot Number" in the third column of FIG. **21**E, the above-described report will be sorted such that lot numbers for each drug code will be displayed. In other words, for each entry date, a list of drug codes will be displayed, and for each drug code, a list of lot numbers will be displayed. Embodiments of the present invention, however, are not limited to this type of sorting. Various ways of sorting information for reports may be utilized without limitation.

Once a report is built it can be viewed by touching the View Report tab **1220***a*, which displays the View Report GUI **1220**, as illustrated in FIG. **21**F. The operator can manipulate vertical and horizontal scroll bars that are provided when a report is displayed to view hidden regions of the report, as would be understood by those skilled in the art. In addition, zoom-in and zoom-out tools are provided to enlarge and reduce the displayed size of a report.

At this point, an operator can choose to print the viewed report or to run the report again with different parameters. To run the report with different parameters, the operator touches the Build Report tab **1210***a*, which displays the Build Report GUI **1210**, selects new parameters, and touches the View Report tab **1220***a*, which displays the View Report GUI **1220**, to rerun the report. To print the viewed report, the operator touches the print GUI control **1240**. However, prior to printing, the operator needs to designate a printer using the Setup GUI **1230**. To designate a printer, the operator touches the

Setup tab **1230***a*, which displays the Setup GUI **1230**, and then selects a printer from the Select Printer GUI **1250**, as illustrated in FIG. **21**G.

Reports can also be exported to other applications and printed from those applications. For example, a report can be exported to a spreadsheet application. When an operator chooses to export a report, the report format is rendered in comma-separated format and is saved to a pre-designated location on the pharmaceutical dispensing system **40**. The pharmaceutical dispensing system **40** uniquely names each exported file. In some embodiments, an exported file is saved in ".csv format" in the form <ReportName_Date_TimeStamp>. However, embodiments of the present invention are not limited to a particular file format for exporting. Other file formats may be utilized.

Device Relationship Management (DRM)

The pharmaceutical dispensing system **40** includes a Device Relationship Management (DRM) component, which provides the following: health monitoring functions for the pharmaceutical dispensing system **40**; local DRM data storage; and a guaranteed data delivery mechanism. Information about the health of the pharmaceutical dispensing system **40** is gathered by a variety of health monitoring functions, which report sensor values (particularly during critical portions of operation of the system **40**), error occurrences, results of periodically performed built-in-tests, and high level machine events.

Sensors may be configured to monitor temperature and/or pressure of various components of the pharmaceutical dispensing system **40**. In addition, the number and/or percent of prescription order filling failures can be monitored. High level machine events can include counting problems, power outages, etc. Built-in tests that can be performed include a system health test that automatically runs on start up to check all of the components of the pharmaceutical dispensing system **40**.

This information is held as time-stamped data in a Local DRM Data Storage facility, specifically a SQL Server Database. The guaranteed data delivery mechanism is implemented as part of a software service that pulls information from the database and either a) transmits it over a secure network connection; or b) downloads it to a removable medium, such as a flash drive.

Referring to FIGS. **22-23**, the DRM system also includes a reliable message delivery system. This system guarantees that in the event of a network outage, power outage, or other situation which causes the system to be unable to send data, no data will be lost until the outage is resolved. When data is received (Block **1300**), it is queued in a database (Block **1310**). The system reads queued data from the DRM database (Block **1400**) and attempts to send the data back to the DRM server (Block **1410**). If the transmission was successful and receipt is acknowledged (Block **1420**), the data is removed from the queue (Block **1430**); otherwise, the data remains in the queue and transmission is retried at the next opportunity.

FIG. **24** illustrates a processor **1500** and a memory **1502** that may be used to implement the operations of the pharmaceutical dispensing system **40** of FIGS. **2-3**, according to some embodiments of the present invention. For example, in some embodiments of the present invention, the processor **1500** and memory **1502** may be used to embody the processors and the memories used in automatically filling prescription orders, in replenishing pills within cells **100**, in modifying parameters of cells **100**, in adding new drugs to inventory, in creating reports, etc.

The processor **1500** communicates with the memory **1502** via an address/data bus **1504**. The processor **1500** may be, for example, a commercially available or custom microprocessor. The memory **1502** is representative of the overall hierarchy of memory devices containing the software and data used to automatically fill prescription orders, to replenish pills within cells **100**, to modify parameters of cells **100**, and to add new drugs to inventory, to generate reports, and to perform device relationship management, in accordance with some embodiments of the present invention. The memory **1502** may include, but is not limited to, the following types of devices: cache, ROM, PROM, EPROM, EEPROM, flash, SRAM, and DRAM.

As shown in FIG. **24**, the memory **1502** may hold seven or more major categories of software and data: an operating system **1506**, a prescription order filling module **1508**, a cell replenishment module **1510**, a cell parameters module **1512**, an add new drug module **1514**, a reports module **1516**, and a Device Relationship Management (DRM) module **1518**. The operating system **1506** controls operations of the prescription order filling module **1508**, cell replenishment module **1510**, cell parameters module **1512**, add new drug module **1514**, reports module **1516**, and DRM module **1518**.

The prescription order filling module **1508** comprises logic for processing prescription orders as described above with respect to the various dispensing side GUIs. The cell replenishment module **1510** comprises logic for monitoring/controlling/modifying drug inventory in each of the cells **100**, as described above with respect to the various replenishing side GUIs. The cell parameters module **1512** comprises logic for monitoring/controlling/modifying parameters for each of the cells **100**, as described above with respect to the various replenishing side GUIs. The add new drug module **1514** comprises logic for adding a new drug to a cell **100**, as described above with respect to the various replenishing side GUIs. The reports module **1516** comprises logic for building, running, exporting, and printing reports from either side of the pharmaceutical dispensing system **40**, as described above with respect to FIGS. **21**A-**21**G. The DRM module **1518** comprises logic for handling and transmitting data to and from the pharmaceutical dispensing system **40**, as described below with respect to FIGS. **22-23**.

Although FIG. **24** illustrates an exemplary software architecture that may facilitate automatically filling prescription orders, replenishing pills within cells **100**, modifying parameters of cells **100**, adding a new drug to inventory, generating reports, and performing device relationship management functions, it will be understood that the present invention is not limited to such a configuration, but is intended to encompass any configuration capable of carrying out the operations described herein.

Computer program code for carrying out operations of the prescription order filling module **1508**, cell replenishment module **1510**, cell parameters module **1512**, add new drug module **1514**, reports module **1516**, and DRM module **1518** may be written in a high-level programming language, such as Python, Java, C, and/or C++, for development convenience. In addition, computer program code for carrying out operations of embodiments of the present invention may also be written in other programming languages, such as, but not limited to, interpreted languages. Some modules or routines may be written in assembly language or even micro-code to enhance performance and/or memory usage. It will be further appreciated that the functionality of any or all of the program modules may also be implemented using discrete hardware components, one or more application specific integrated circuits (ASICs), or a programmed digital signal processor or

microcontroller. Embodiments of the present invention are not limited to a particular programming language.

The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although a few exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. Therefore, it is to be understood that the foregoing is illustrative of the present invention and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the scope of the appended claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

That which is claimed is:

1. A pharmaceutical dispensing system, comprising:

a frame having first and second opposed sides;

a plurality of cells configured to house pharmaceutical pills, each of the cells being accessible from the first side of the frame for replenishment of pharmaceutical pills therein;

a plurality of chutes, each of the chutes connected to and associated with a respective one of the plurality of cells, each of the chutes being accessible from the second side of the frame for dispensing of pharmaceutical pills;

a first touch screen display on the frame first side;

a second touch screen display on the frame second side;

a processor;

memory coupled to the processor;

a computer program residing in the memory that is executable by the processor for displaying a cell inventory graphical user interface (GUI) within the first touch screen display, wherein the cell inventory GUI displays cell inventory information, and wherein the cell inventory GUI comprises one or more GUI controls that are responsive to user touching for adding and/or modifying contents of the cells; and

a computer program residing in the memory that is executable by the processor for displaying a prescription processing GUI within the second touch screen display, wherein the prescription processing GUI displays an array of chute icons, wherein each chute icon corresponds to a respective chute and displays an identification of the respective chute, wherein each chute icon is expandable to an enlarged chute icon display size in response to user touching thereof, wherein each chute icon is configured to display a number of pills contained within the respective chute when in the enlarged display size, and wherein each chute icon is displayed with a graphic effect that indicates a status of a prescription order for the respective chute.

2. The system of claim **1**, wherein a record for each prescription order in a queue for the respective chute is displayed in the prescription processing GUI in response to a user touching the chute icon corresponding to the respective chute, and wherein each record comprises status information for the corresponding prescription order.

3. The system of claim **2**, wherein each prescription order record is displayed with a graphic effect that indicates the status of a respective prescription order.

4. The system of claim **3**, wherein the prescription order record graphic effect comprises a color.

5. The system of claim **1**, wherein each chute icon comprises a border and wherein the border is displayed with a graphic effect that indicates the status of a prescription order for the respective chute.

6. The system of claim **5**, wherein the graphic effect comprises a color.

7. The system of claim **1**, wherein each chute icon displays indicia that indicate that a prescription order is ready in the respective chute.

8. The system of claim **1**, wherein each chute icon displays indicia that indicate that a prescription order for the respective chute is incomplete.

9. The system of claim **1**, wherein a representation of each cell in the cell inventory GUI is displayable in a color that indicates an inventory level of pharmaceutical pills in a corresponding cell.

10. The system of claim **1**, further comprising a computer program residing in the memory that is executable by the processor for displaying a report builder GUI within the first and second touch screen displays, wherein the report builder GUI is configured to build reports relating to one or more of the following: pending prescription orders, filled prescription orders, cell inventory information, and drug information.

11. The system of claim **1**, further comprising a computer program residing in the memory that is executable by the processor for monitoring selected functions of the pharmaceutical dispensing system and for storing selected parameters associated with the monitored functions.

12. A pharmaceutical dispensing system, comprising:

a frame having first and second opposed sides;

a plurality of cells configured to house pharmaceutical pills, each of the cells being accessible from the first side of the frame for replenishment of pharmaceutical pills therein;

a plurality of chutes, each of the chutes connected to and associated with a respective one of the plurality of cells, each of the chutes being accessible from the second side of the frame for dispensing of pharmaceutical pills;

a touch screen display on the frame second side;

a touch screen display on the frame first side;

a processor;

memory coupled to the processor;

a computer program residing in the memory that is executable by the processor for displaying a prescription processing GUI within the touch screen display, wherein the prescription processing GUI displays an array of chute icons, wherein each chute icon corresponds to a respective chute and displays an identification of the respective chute, wherein each chute icon is expandable to an enlarged chute icon display size in response to user touching thereof, wherein each chute icon is configured to display a number of pills contained within the respective chute when in the enlarged display size, and wherein each chute icon is displayed with a graphic effect that indicates the status of a prescription order for the respective chute; and

a computer program residing in the memory that is executable by the processor for displaying a cell inventory graphical user interface (GUI) within the touch screen display on the frame first side, wherein the cell inventory GUI displays cell inventory information, and wherein the cell inventory GUI comprises one or more GUI controls that are responsive to user touching for adding and/or modifying contents of the cells.

13. The system of claim **12**, wherein a record for each prescription order in a queue for the respective chute is displayed in the prescription processing GUI in response to a

user touching the chute icon corresponding to the respective chute, and wherein each record comprises status information for the corresponding prescription order.

14. The system of claim **13**, wherein each prescription order record is displayed with a graphic effect that indicates the status of the corresponding prescription order.

15. The system of claim **12**, wherein a representation of each cell in the cell inventory GUI is displayable in a color that indicates an inventory level of pharmaceutical pills in a corresponding cell.

16. The system of claim **12**, further comprising a computer program residing in the memory that is executable by the processor for displaying a report builder GUI within the first and second touch screen displays, wherein the report builder GUI is configured to build reports relating to one or more of the following: pending prescription orders, filled prescription orders, cell inventory information, and drug information.

17. The system of claim **12**, further comprising a computer program residing in the memory that is executable by the processor for monitoring selected functions of the pharmaceutical dispensing system and for storing selected parameters associated with the monitored functions.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,972,050 B2
APPLICATION NO.	: 12/466717
DATED	: March 3, 2015
INVENTOR(S)	: Johnson et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification:

Column 1, Line 43: Please correct "and 6,1767392"
to read -- and 6,176,392 --

Signed and Sealed this
Twenty-first Day of July, 2015

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office